WATER SUPPLY REVIEW and SNOW SURVEY SUMMARY

Alberta
ENVIRONMENT

Water Resources

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1984/85

COVER PHOTO
ALBERTA GOVERNMENT PHOTO

NOTES

The Water Supply Review and Snow Survey Summary report is produced annually after the close of the irrigation season. The Review is preceded by the "Water Supply Outlook and Snow Survey Bulletin" which is published four times each year in March, April, May, and June, and by the "Water Supply Outlook" updates which are published in July and August.

The River Forecast Centre and the Survey Branch of Alberta Environment acknowledge the assistance of Alberta Energy & Natural Resources (the Alberta Forest Service) and Environment Canada (Water Survey of Canada and the Atmospheric Environment Service) in providing precipitation and streamflow data for this report.

The streamflow hydrographs and the natural flow data presented in this report are based on tentative hydrometric records which are subject to revision.

The snow survey data and Sacramento Storage Gauge data presented in Appendix A, and the real-time precipitation data presented in Appendix C are also preliminary data which are subject to revision.

Units of Measure

Parameter	Units of Measure (metric)	Conversion to Imperial Units
Snow Depth	centimetres	2.54 cm = 1 inch
Water Equivalent	millimetres	25.4 mm = 1 inch
Elevation	metres	1 m = 3.28 feet
Streamflow	cubic metres per second	1 m^3/s = 35.3 cfs
Volume	cubic metres	1 X 10^6 m^3 = 811 acre-feet

WATER SUPPLY REVIEW AND SNOW SURVEY SUMMARY

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WATER SUPPLY REVIEW AND SNOW SURVEY SUMMARY

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Alberta
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WATER SUPPLY CONDITIONS REVIEW

1985

Summary

1985 was a year of water supply extremes in Alberta. Streamflow reached record low levels in some parts of southern Alberta in July and August, but by September, several rivers in the south were at their highest levels for the year. The extremely wet weather of September did much to improve the water supply situation for the winter of 1985/86. It also improved the water storage situation in the irrigation reservoirs of southern Alberta prior to freeze-up which will have a beneficial effect on water supply for the summer of 1986. Furthermore, it also had a profound effect on soil moisture conditions, changing them from very dry in mid-August to very wet by mid-October. This factor may improve water supply conditions for 1986 by enhancing spring snowmelt runoff conditions and reducing irrigation demand during the early part of the season.

Weather Conditions during the Winter of 1984/85

The autumn of 1984 was extremely wet and cold throughout Alberta. Soil moisture conditions at the time of freeze-up were relatively wet, a situation which contributed to high spring runoff in some areas in March and April of 1985. Snowfall during the early part of the winter was about average so that the snowpack conditions on the plains and in the mountains at the end of December 1984 were generally normal or above normal.

In January 1985, however, a trend of dry weather established itself and prevailed until mid-August. Even so, snowpack conditions on the plains remained close to normal up to the time of the spring melt because of a relative lack of chinook activity which can deplete the snowpack during the winter months, particularly in southern Alberta. The primary exception to this condition occurred in the Grande Prairie-Beaverlodge area where the snowpack was virtually non-existent for much of the winter. Mountain snowpack conditions gradually deteriorated because of the lack of snowfall so that, by the end of April 1985, the mountain snowpack was generally below average.

A map of precipitation for the entire province for the winter of 1984/85 expressed as a percentage of average is presented as Figure 1. A similar map for southern Alberta is given as Figure 2. A map of mountain snowpack conditions in southern Alberta at the end of April 1985 is presented as Figure 3. Graphs of winter precipitation accumulation for a number of locations in southeastern Alberta are presented as Figure 4. Similar graphs for other weather stations are presented in the individual river basin sections included in this report.

Weather Conditions during the Spring and Summer of 1985

The spring and early summer of 1985 was very dry in most parts of Alberta. A map of total precipitation as a percent of average for the period May 1 to July 31 for the entire province is presented as Figure 5. A similar map for southern Alberta is presented as Figure 6. The months of June and July were particularly dry in the south. For these two months, the total amount of rainfall at Lethbridge was only 10 millimetres which compares to a normal total for the period of 122 millimetres. The total June-July rainfall for Medicine Hat was only 17 millimetres compared to a normal of 104 millimetres. Temperature conditions were generally above average in May, average in June and much above average in July.

Weather Conditions during the Spring and Summer of 1985 (cont'd)

In contrast, the latter part of the summer and the autumn period were much wetter and cooler than normal, particularly in those areas of the south which were the driest during the first half of the season. A map of total precipitation as a percent of average for the period August 1 to October 31 for the province is given in Figure 7. A similar map for the southern part of Alberta is given as Figure 8.

The net result for the season from May 1 to October 31 taken as a whole was that most areas in Alberta received close to average amounts of precipitation for the period as illustrated in Figures 9 and 10. The timing of the precipitation in 1985 left much to be desired, however, with much of the rainfall occurring within the space of a few days in September near the close of the irrigation season. Figure 11 shows the actual pattern of precipitation accumulation for Lethbridge and Calgary during the 1985 summer season as compared to a range of normal accumulation behaviour.

Figures 12 presents the monthly accumulation of precipitation for the summer season for several climate stations in southeastern Alberta.

Streamflow Conditions in Southern and Central Alberta

The major streams which originate in the Rocky Mountains experienced peak flows from snowmelt at the normal time in late May or early June in most cases. Rates of flow ranged from normal to below normal in the early summer but no immediate water supply problems resulted at this time. After the snowmelt peak, however, river levels generally fell quickly during the latter part of June because of the lack of rainfall. June is typically the month of greatest rainfall in southern and central Alberta. By mid-July, river levels in many parts of the south were extremely low causing a multitude of water supply difficulties. The flow of the Oldman River near Lethbridge reached record low levels from mid-July to mid-August. In late July, the flow in parts of the Oldman River upstream of Lethbridge fell to virtually zero as a result of the combination of extremely low natural flow in the river and extremely high rates of diversion from the river for irrigation.

Irrigation diversion rates were relatively high throughout the 1985 season. Most irrigation districts received water diverted from the rivers at rates which satisfied operational requirements. The exception again this year was the Lethbridge Northern Irrigation District. By mid-July, the flow in the Oldman River at the LNID diversion weir became less than the diversion capacity, restricting the water supply to the District.

The wet weather from mid-August to the end of October turned the streamflow situation around. A major storm in southern Alberta in mid-September created the highest river levels of the year on many streams. After this event, streamflow remained at or above normal rates for the rest of the season. The change in streamflow conditions had a significant effect on improving the water storage situation in southern and central areas which, by mid-August, was very poor.

Hydrographs for a number of river locations are presented in the individual river basin sections which follow this summary.

The flow of the South Saskatchewan River into Saskatchewan remained much below average throughout the summer until mid-September. Despite the extremely low streamflow conditions, however, the Province of Alberta was successful in meeting its commitments under the Master Agreement on Apportionment to pass at least half of the natural flow of the South Saskatchewan River to the Province of Saskatchewan. The hydrograph for the South Saskatchewan River below the Red Deer River confluence (at the Saskatchewan border) is presented as Figure 13.

Water Supply Volumes for Southern and Central Alberta

Water supply conditions during the summer of 1985 were generally lower than was expected in the late spring. The primary reason for the difference between the spring forecasts and the actual supply for the summer was the lack of early summer rainfall. The forecasts assume that precipitation for the coming months will probably be close to normal.

Because of the wet autumn, the natural flow volume (recorded flow adjusted for reservoir storage and upstream diversions) statistics for the summer season do not properly reflect the severity of the situation in 1985. Even with the relatively high flow conditions in September and October, the natural flow volumes for the major river locations in southern and central Alberta ranged from below average to much below average. The natural flow for the month of July is probably one of the best indicators of low streamflow conditions in 1985.

The volumes as a percent of average for various key locations for both the entire season and for the month of July are presented in the table below along with the May 1985 volume forecasts.

Location	May 1985 Seasonal Volume Forecast % of average	Actual Natural Flow for the Season % of average	Actual Natural Flow for July % of average
Milk River at Milk River	50	21	0
Oldman River at Lethbridge	84	63	38
Bow River at Calgary	85	71	59
Red Deer River at Red Deer	90	57	33
North Saskatchewan River at Edmonton	87	72	62

A detailed account of the seasonal natural flow volumes for the major streams of southern and central Alberta in 1985 is presented as Table 1.

Water Storage Situation

Storage facilities began the 1985 runoff season at generally normal levels. Below average summer runoff coupled with high irrigation demand for water resulted in below average levels in many of the important reservoirs in southern and central Alberta by the end of July. The cool, wet weather of September and October allowed most of these reservoirs to recover to normal levels before winter.

In the Lethbridge Northern Irrigation District, storage in Keho Lake was virtually depleted by mid-July and did not recover significantly until the latter part of August. During this period, the low flow in the Oldman River at the diversion weir limited the rate at which Keho could be refilled.

A detailed account of the water storage situation as of November 1, 1985 is presented in Table 2.

Snow Survey Data and Monthly Precipitation Data

Alberta Environment conducts routine snow surveys throughout Alberta each winter and spring to monitor snowpack conditions for water supply and flood forecasting. The snow survey data for 1984/85 are presented in Appendix A of this report. Data from the snow pillows (snowpack measuring sensors) operated by the Department are also presented graphically in Appendix A. Indexes and reference maps for the mountain and plains area snow course networks are provided in Appendix B.

Alberta Environment operates a network of 37 automatic climate station in the headwaters of the South Saskatchewan River Basin to provide data for flood and water supply forecasting. Monthly precipitation totals since November 1984 for these stations are provided in Appendix C. A map showing the station locations is also provided.

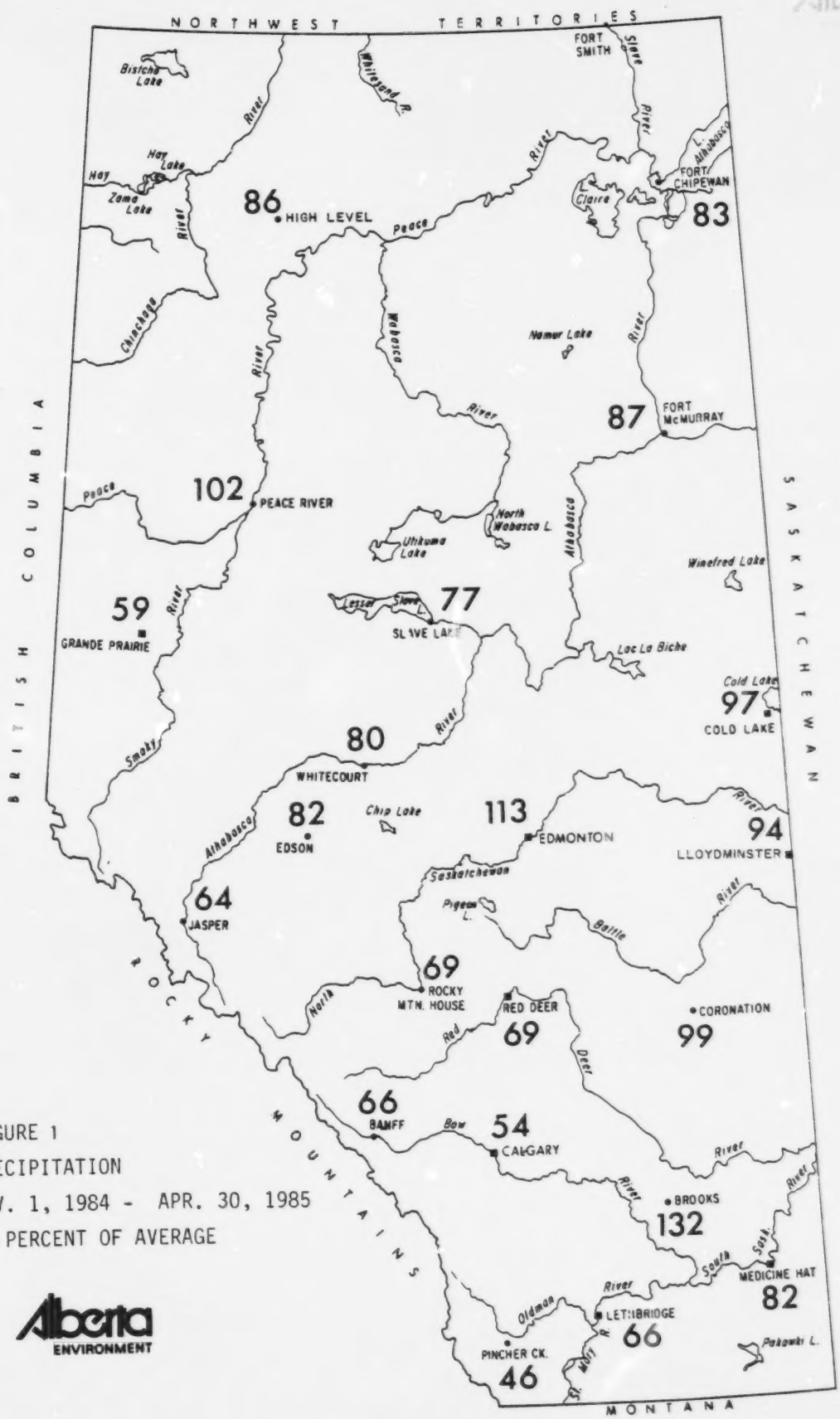


FIGURE 1
PRECIPITATION
NOV. 1, 1984 - APR. 30, 1985
AS PERCENT OF AVERAGE

Alberta
ENVIRONMENT

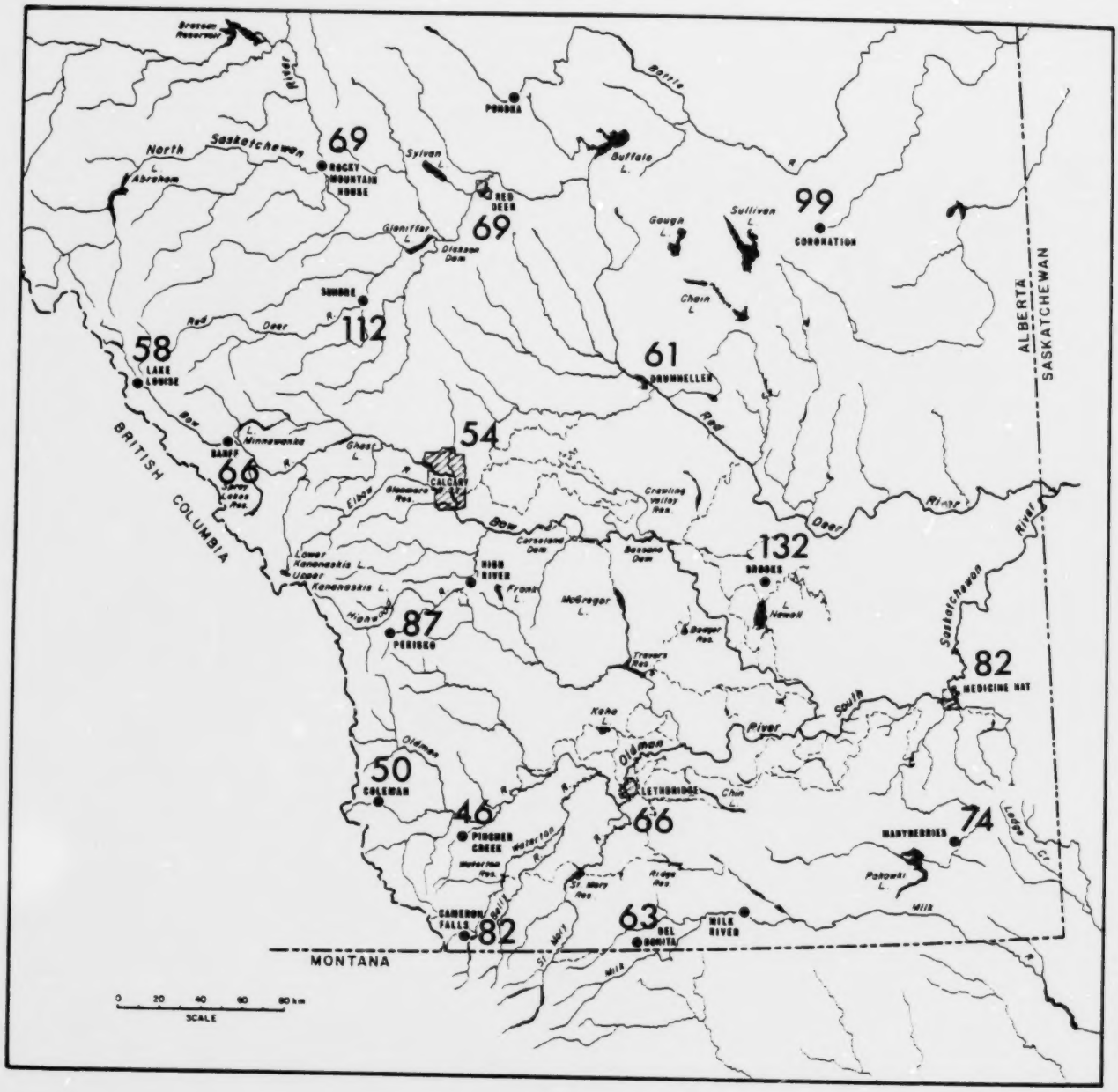


FIGURE 2

PRECIPITATION

SOUTHERN ALBERTA

NOV. 1, 1984 - APR. 30, 1985

AS A PERCENT OF AVERAGE

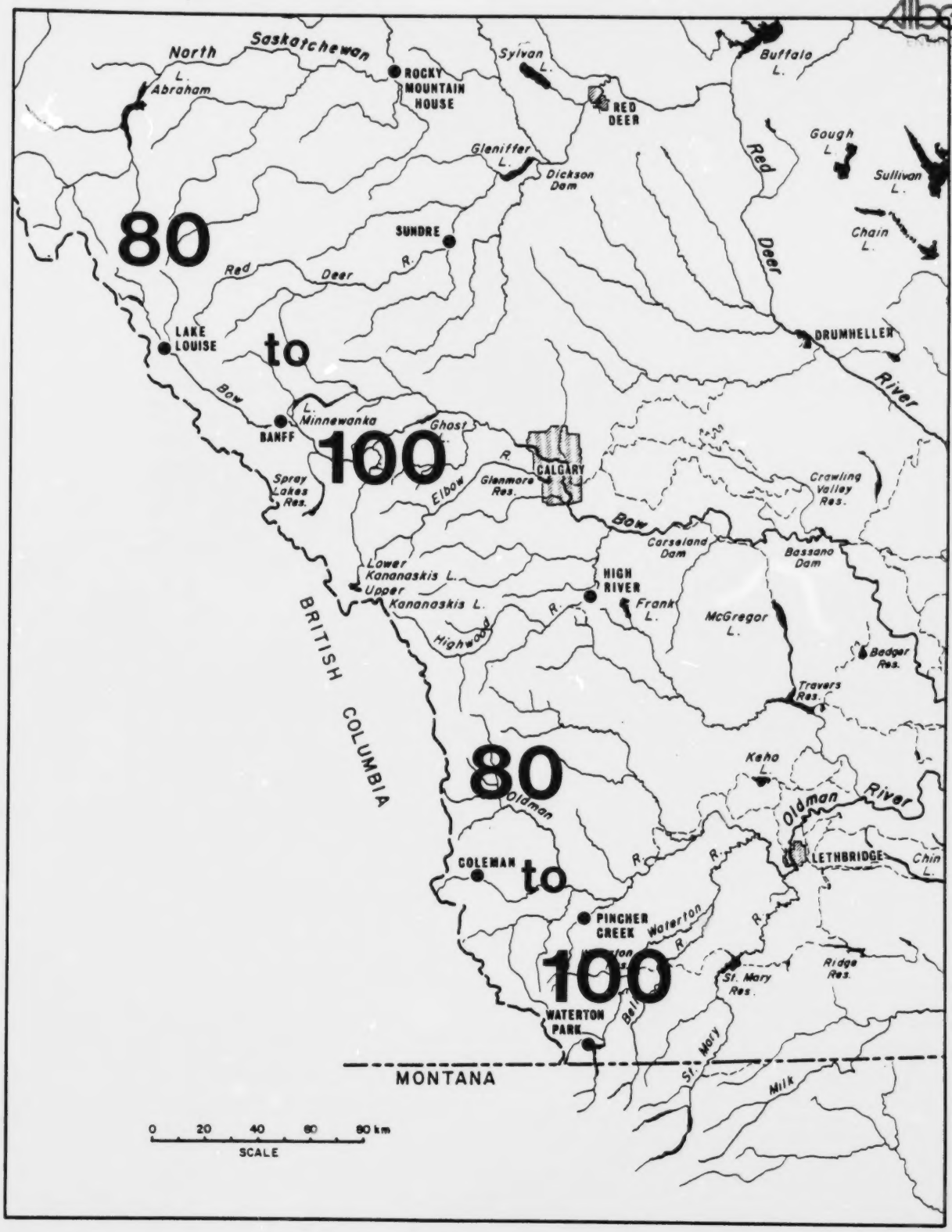
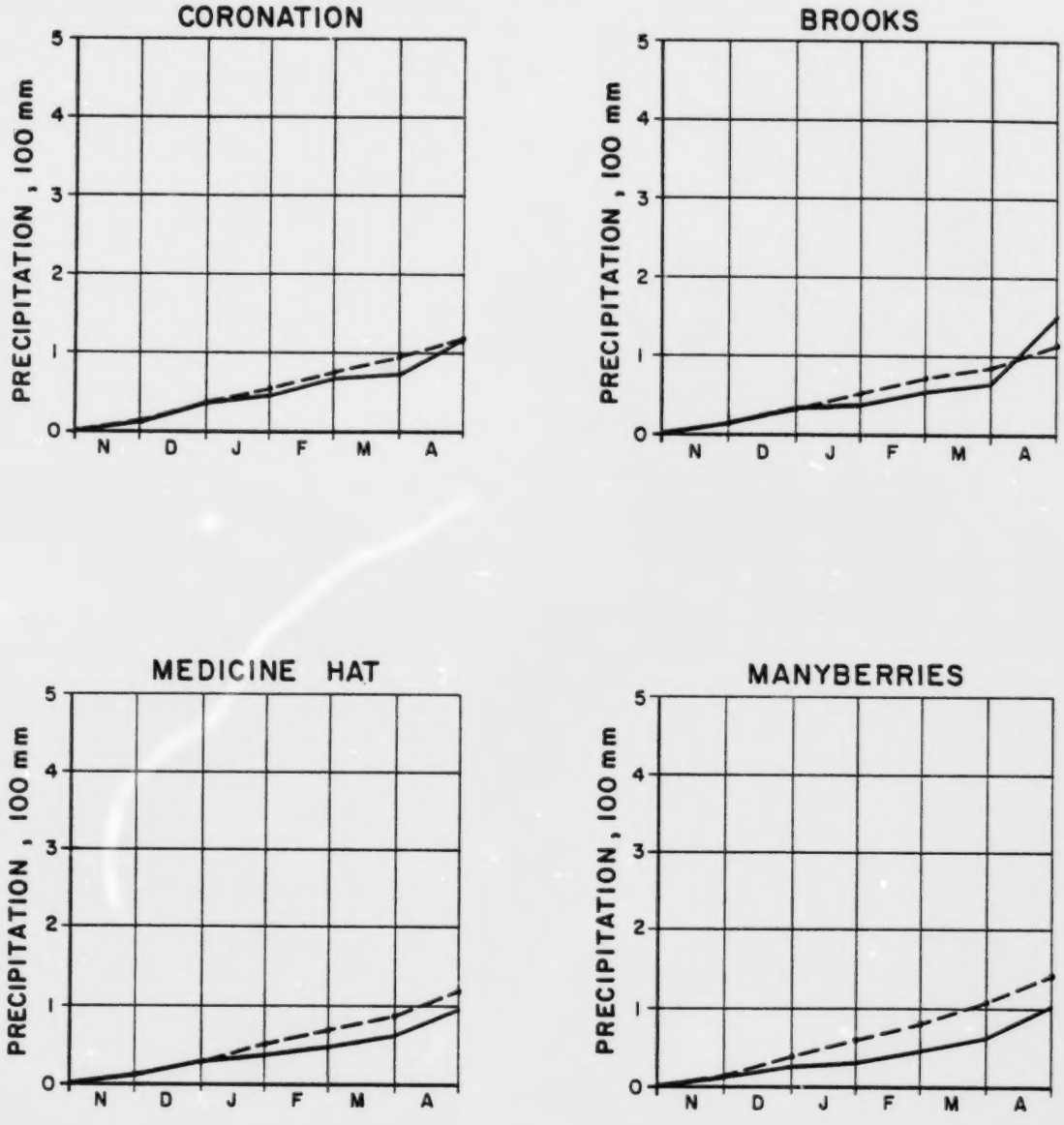


FIGURE 3

MOUNTAIN AREA SNOWPACK

MAY 1, 1985

AS A PERCENT OF AVERAGE



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		WINTER PRECIPITATION SOUTHEASTERN ALBERTA	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE FEB., 1985	FIGURE 4

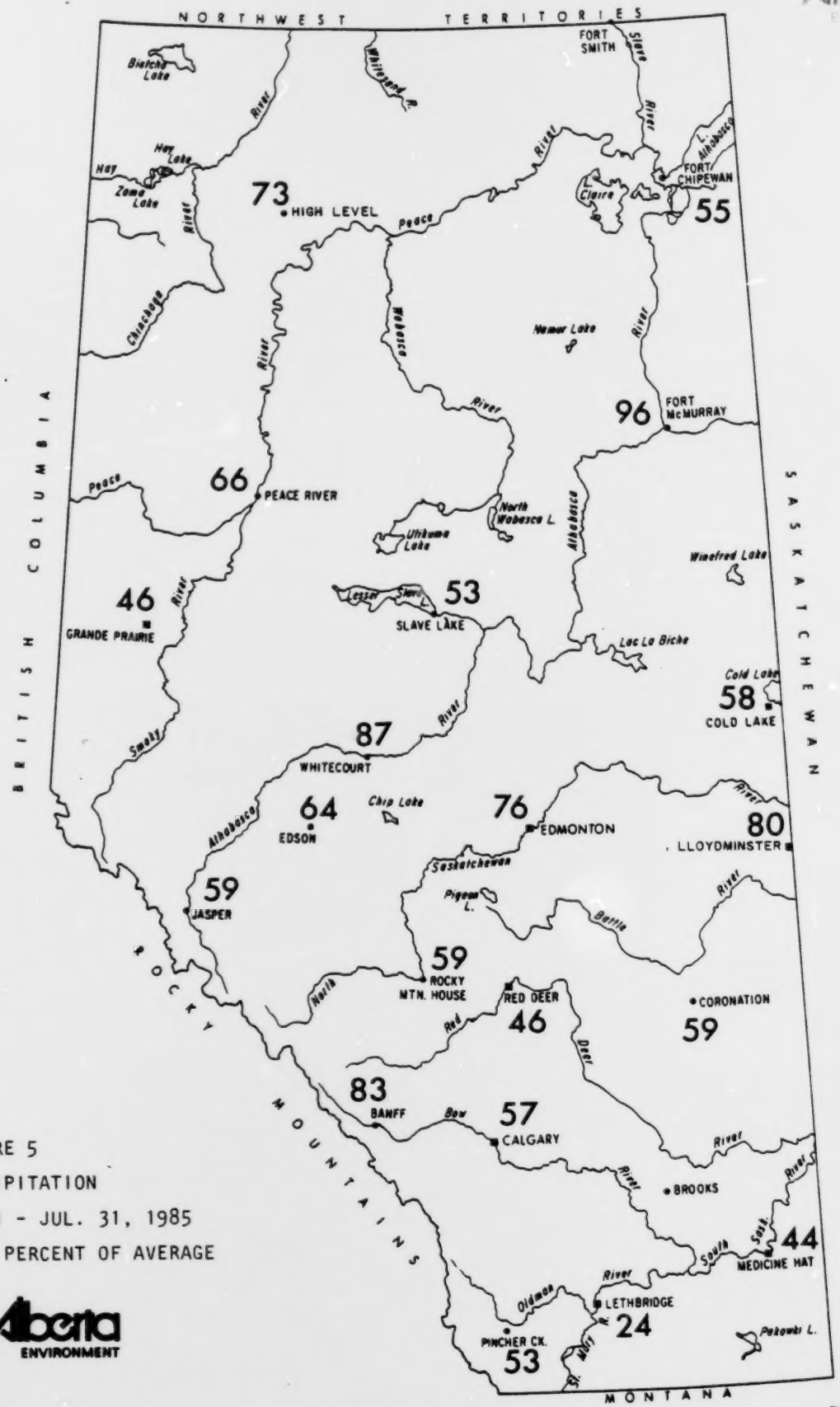


FIGURE 5
PRECIPITATION
MAY 1 - JUL. 31, 1985
AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

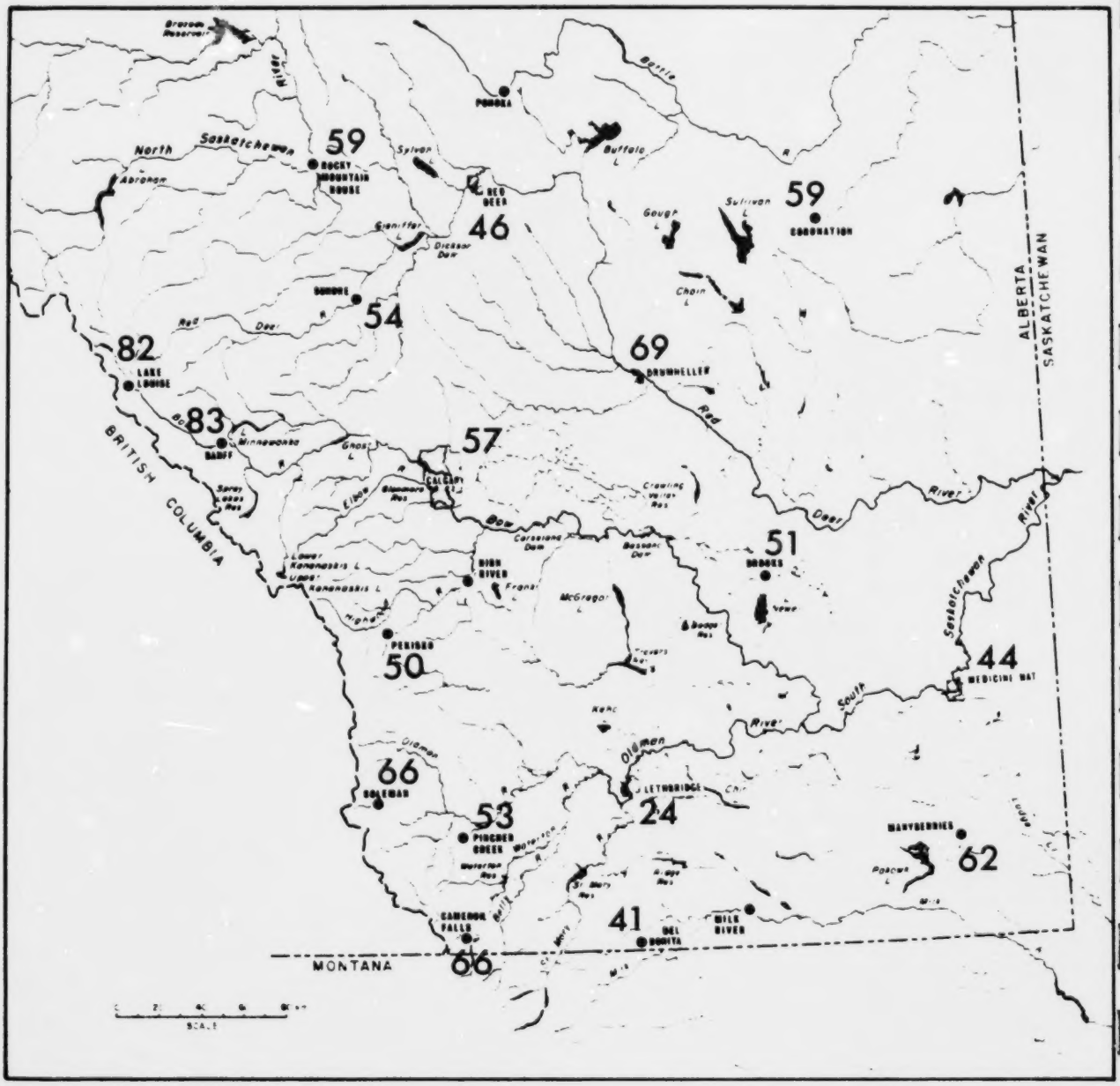


FIGURE 6

PRECIPITATION

SOUTHERN ALBERTA

MAY 1 - JUL. 31, 1985

AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

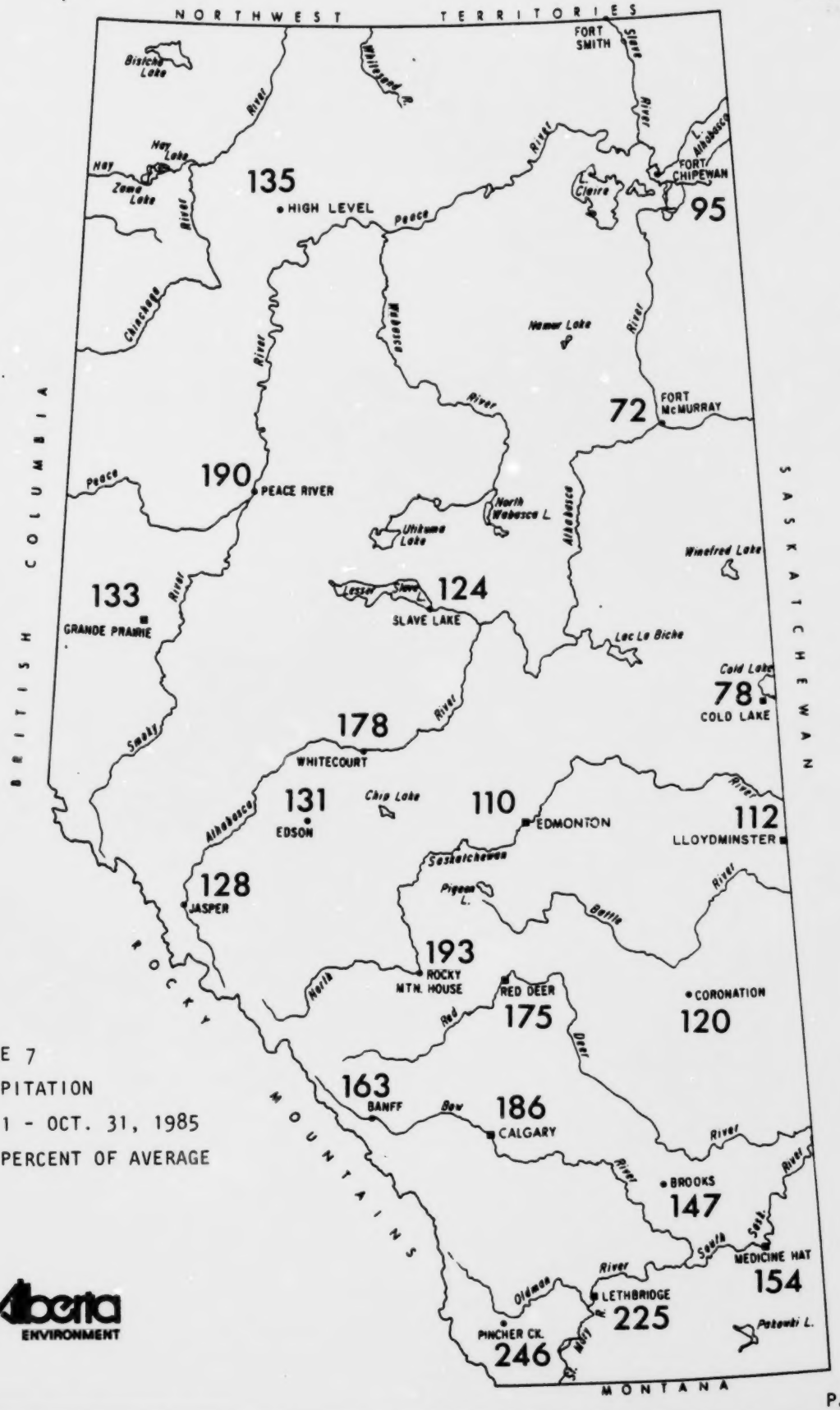


FIGURE 7
PRECIPITATION
AUG. 1 - OCT. 31, 1985
AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

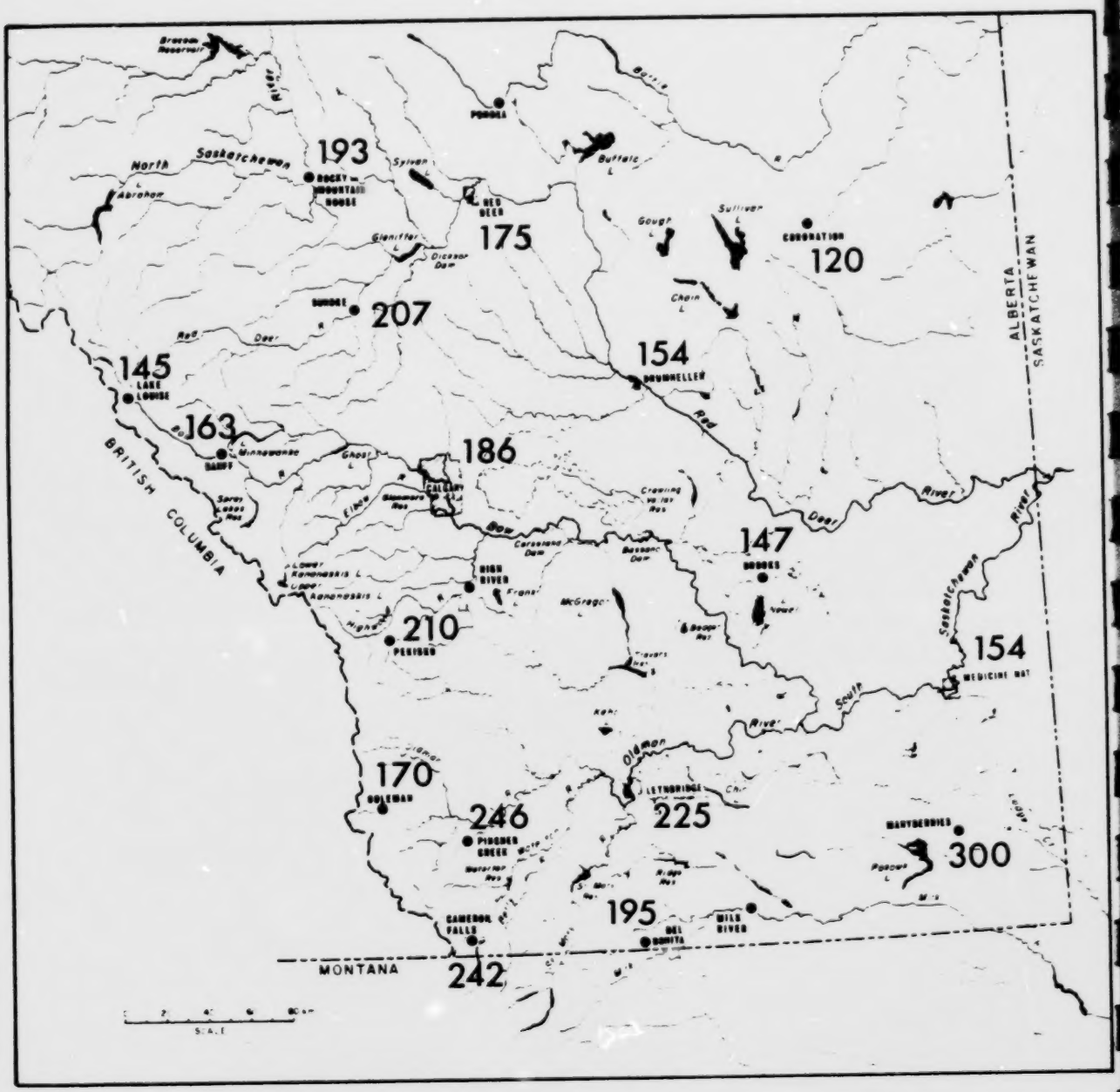


FIGURE 8

PRECIPITATION

SOUTHERN ALBERTA

AUG. 1 - OCT. 31, 1985

AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

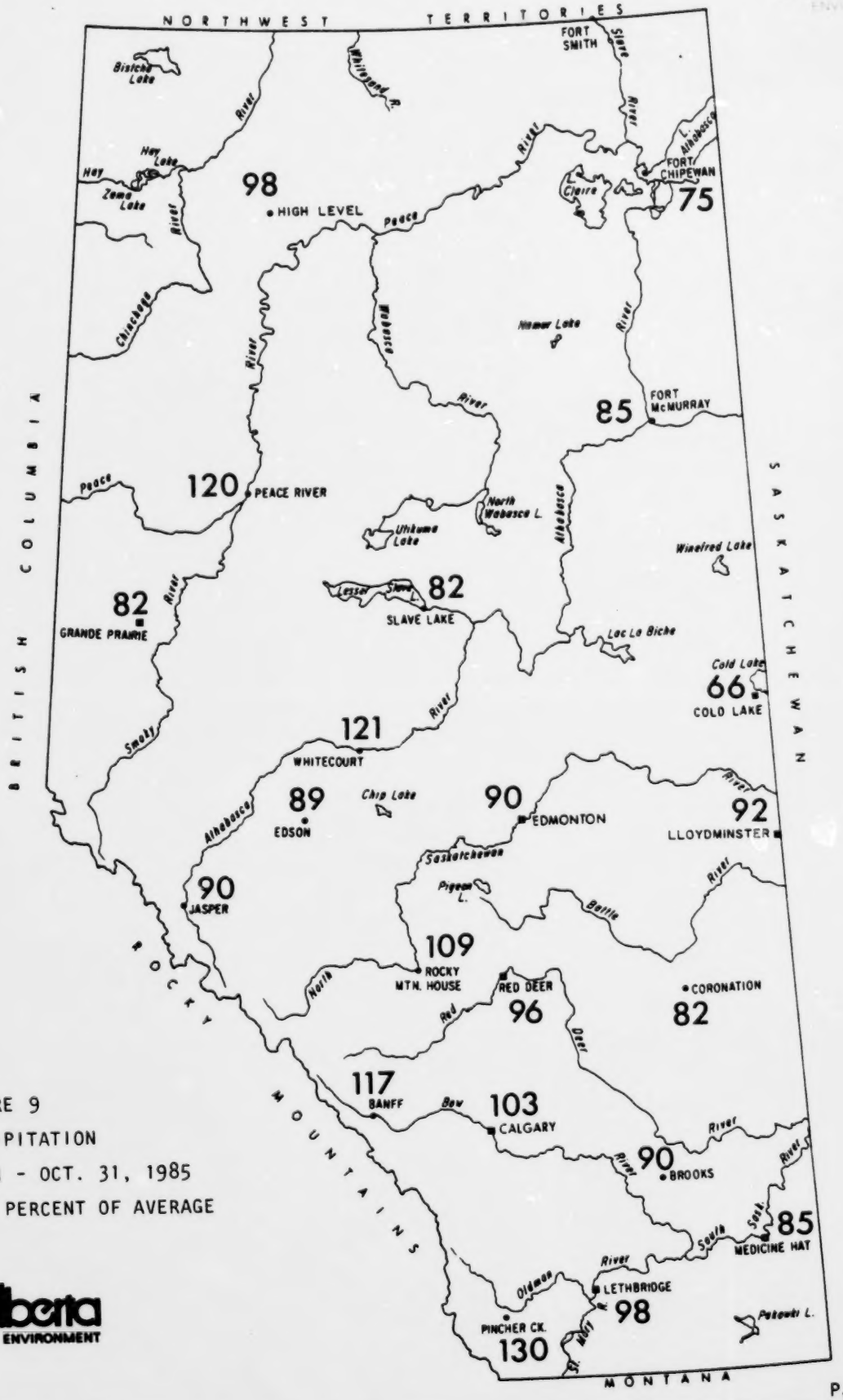


FIGURE 9
PRECIPITATION
MAY 1 - OCT. 31, 1985
AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

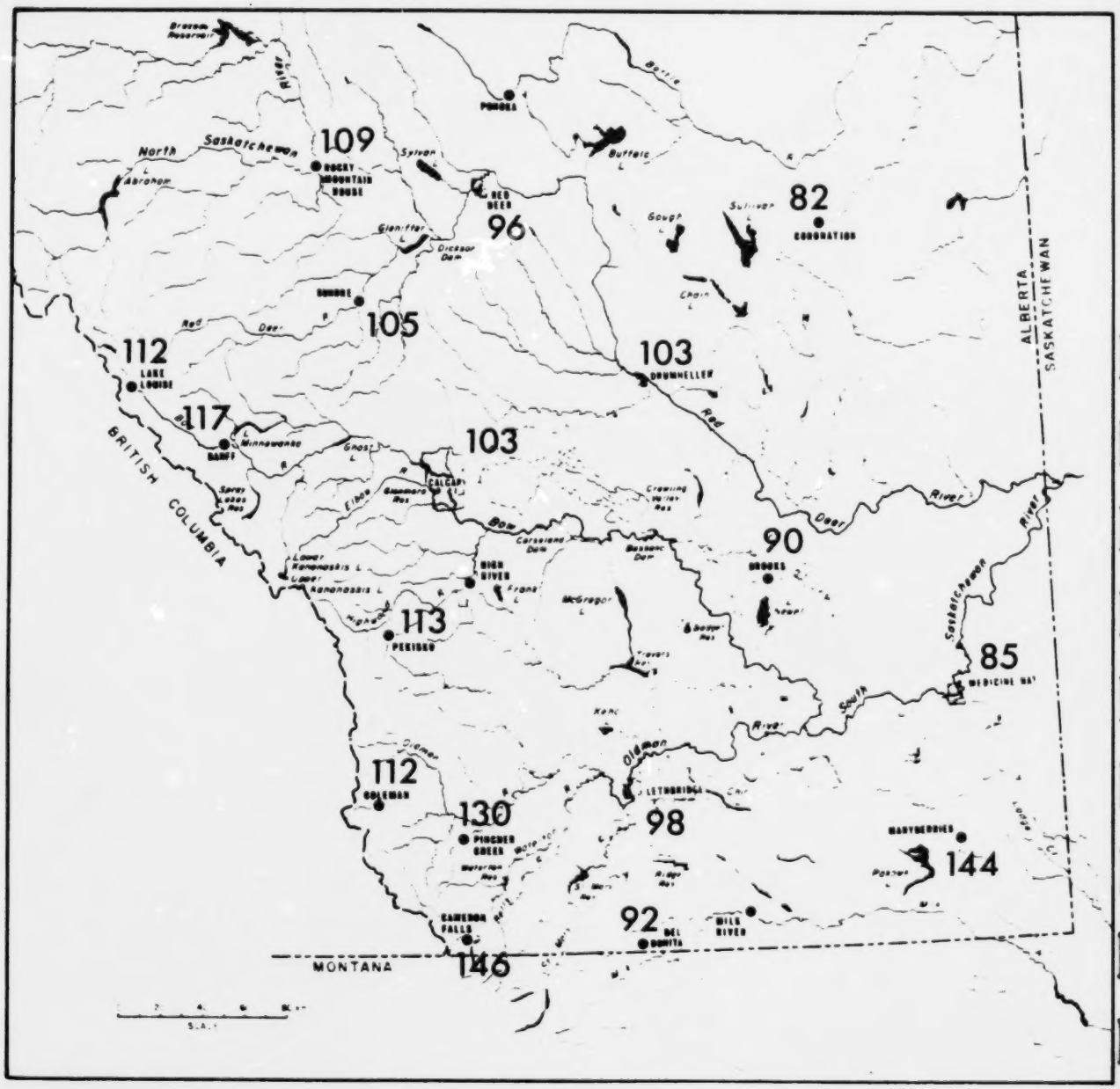


FIGURE 10

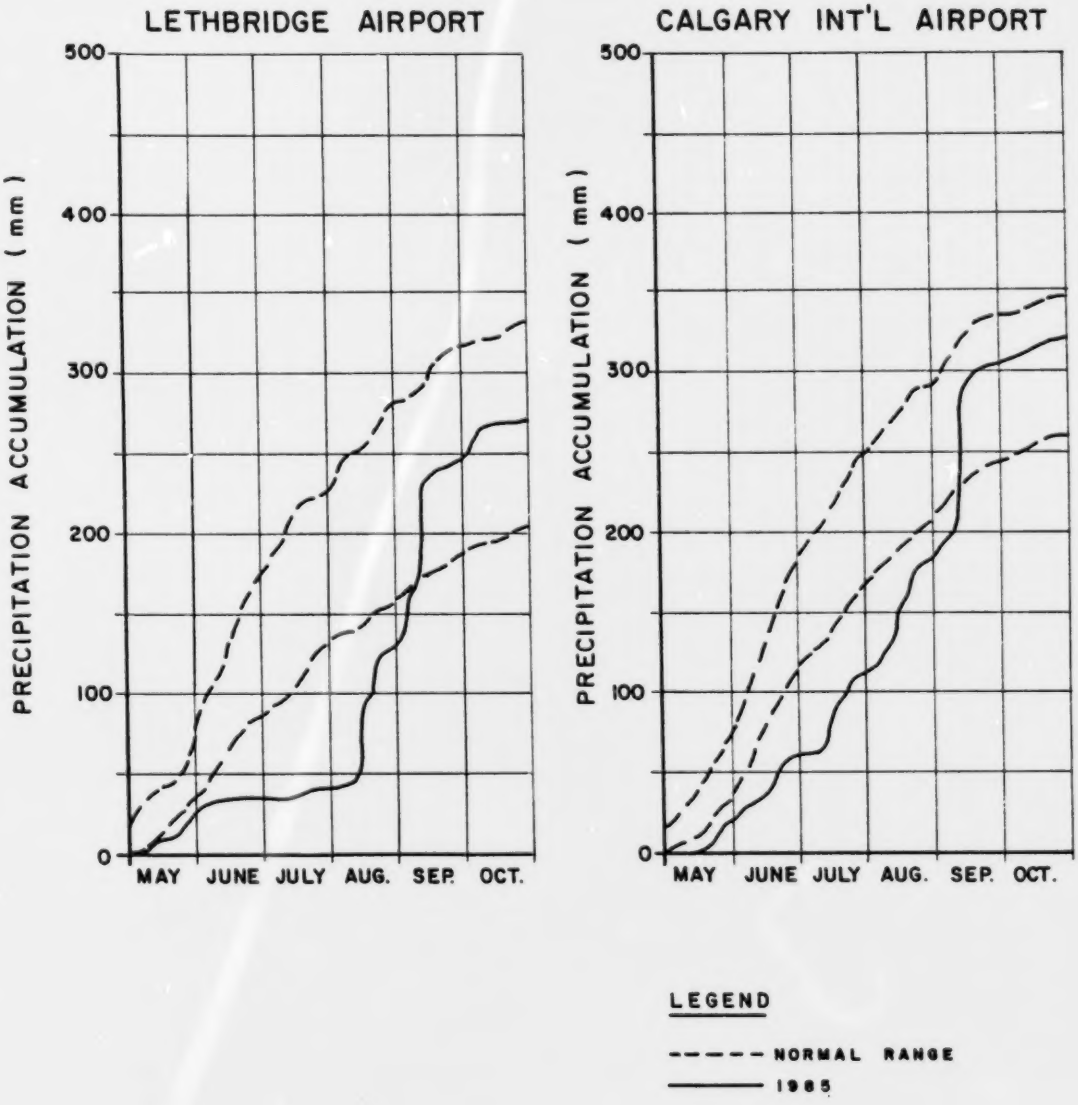
PRECIPITATION

SOUTHERN ALBERTA

MAY 1 - OCT. 31, 1985

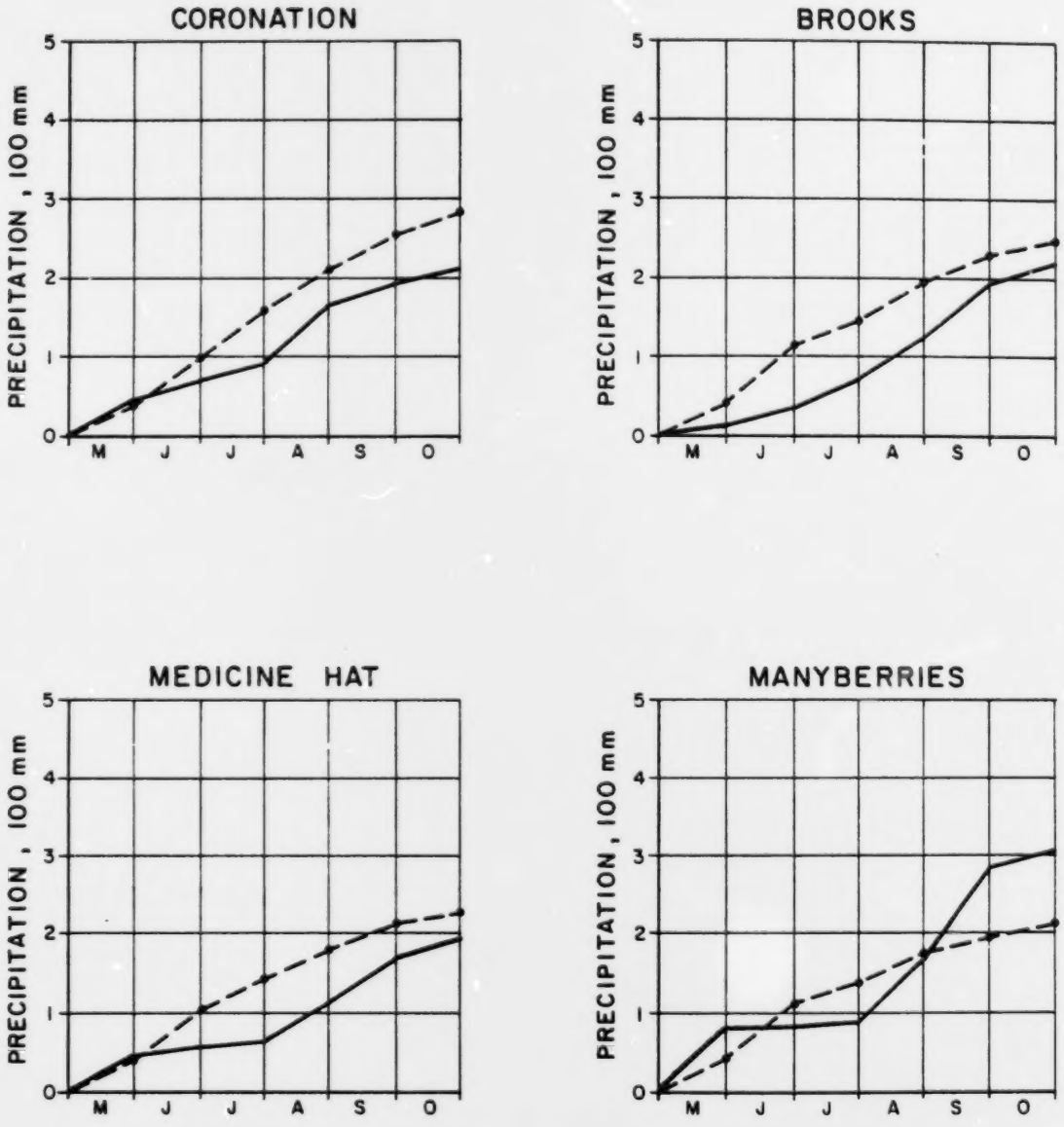
AS A PERCENT OF AVERAGE

Alberta
ENVIRONMENT

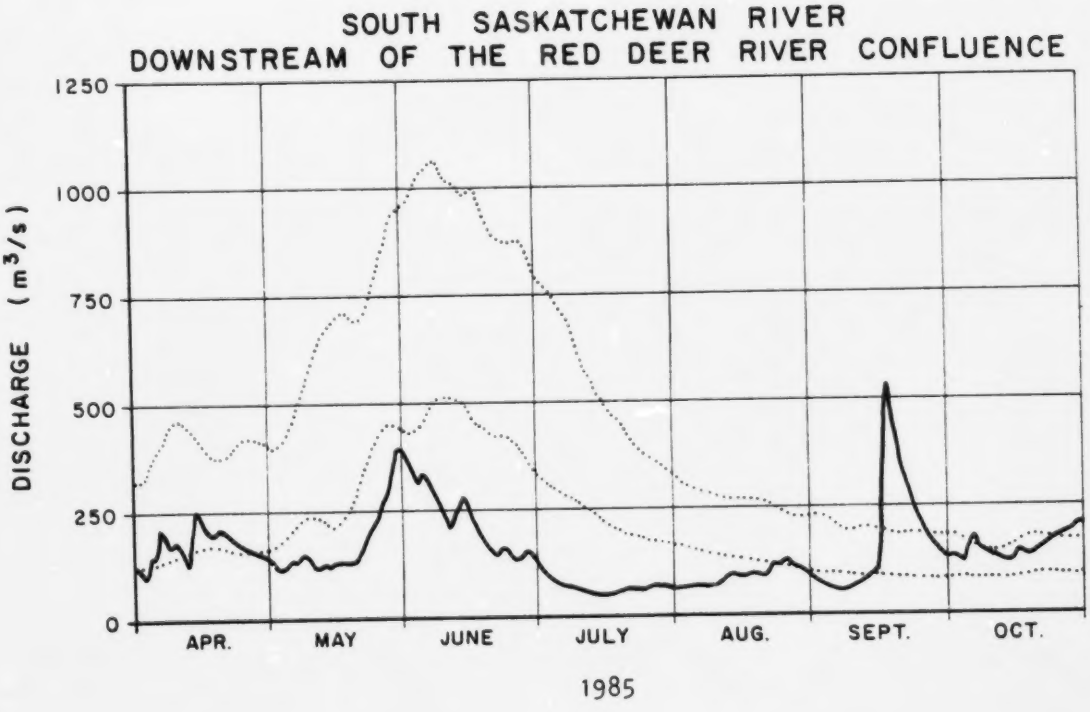


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		SUMMER PRECIPITATION ACCUMULATION SOUTHERN ALBERTA
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED	DRAWN E. Blenkinsopp	SCALE AS SHOWN



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		SUMMER PRECIPITATION SOUTHEASTERN ALBERTA
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984
		FIGURE 12 Page 16



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPH SOUTH SASKATCHEWAN RIVER
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1985

WATER SUPPLY CONDITIONS REVIEW

TABLE 1

WATER SUPPLY CONDITIONS IN 1985
(Natural Flow)

	Streamflow Volume* for entire season		Streamflow Volume* for July 1985
	$10^6 m^3$	% of Avg.	% of Avg.
MILK RIVER BASIN			
Milk River at Milk River (Apr-Sept)	20	21	0
Lodge Creek at Saskatchewan border (Mar-May)	17	81	0
OLDMAN RIVER BASIN (April to September)			
St. Mary River near Int'l Boundary	590	81	54
Belly River near Mountain View	220	82	57
Waterton River at Waterton Park	410	79	44
Oldman River near Fort McLeod	660	54	28
Oldman River near Lethbridge	2,050	63	38
BOW RIVER BASIN (May to September)			
Bow River at Banff	810	76	67
Bow River at Calgary	1,680	71	59
Elbow River	130	66	38
Highwood River	310	49	22
Lake Minnewanka Inflow	120	55	42
Spray Lake Inflow	240	75	59
Barrier Lake Inflow (Kananaskis R.)	270	68	63
RED DEER RIVER BASIN (May to September)			
Gleniffer Lake Inflow (Dickson Dam)	420	50	39
Red Deer River at Red Deer	580	57	33
NORTH SASKATCHEWAN RIVER BASIN (April to September)			
Lake Abraham Inflow (Bighorn Dam)	1,820	83	87
Brazeau Reservoir Inflow	1,110	78	56
North Saskatchewan River at Edmonton	4,210	72	62

* NOTE: Volumes indicate natural runoff conditions; adjustments have been made to recorded streamflow to account for the effects of streamflow diversion and reservoir storage.

$1 \times 10^6 m^3$ = 811 acre-feet = 409 cfs-days

WATER SUPPLY CONDITIONS REVIEW

TABLE 2

MAJOR WATER STORAGE RESERVOIRS IN ALBERTA

Status as of NOVEMBER 1, 1985

	LIVE STORAGE ($10^6 m^3$)	PERCENT OF MAXIMUM LIVE STORAGE	REMARKS	LIVE STORAGE Nov. 1, 1984 ($10^6 m^3$)
OLDMAN RIVER BASIN				
Keho Lake	42	89	Normal	7
Waterton Reservoir	63	55	Normal	11
St. Mary Reservoir	280	76	Normal	135
Ridge Reservoir	92	71	Normal	97
Chin Reservoir	190	91	Normal	176
TOTAL	625	76	Normal	419
BOW RIVER BASIN				
Lake Minnewanka	107	48	Below Normal	112
Spray Lake	236	90	Normal	244
Upper Kananaskis Lake	120	96	Normal	102
Lower Kananaskis Lake	51	81	Below Normal	57
TOTAL	514	76	Normal	515
Lake McGregor	322	100	Normal	318
Travers Reservoir	71	67	Normal	73
TOTAL	393	92	Normal	391
Lake Newell	127	72	Below Normal	146
Crawling Valley Reservoir	39	35	*	0
TOTAL	166	57	Below Normal	146
RED DEER RIVER BASIN				
Gleniffer Lake	202	100	Normal	206
NORTH SASKATCHEWAN RIVER BASIN				
Lake Abraham	1,019	72	Below Normal	1,160
Brazeau Reservoir	472	97	Normal	444
TOTAL	1,491	79	Normal	1,604

NOTES: 1 x $10^6 m^3$ = 811 ac-ft = 409 cfs-days

* Crawling Valley Reservoir was brought into use for the first time in 1985.

MILK RIVER BASIN 1985

Weather Conditions

Precipitation during the winter of 1984/85 and during the spring and early summer of 1985 was consistently below average in the western headwaters of the basin. A pattern of wet weather established itself in mid-August, persisting to the end of October.

In the Cypress Hills, weather patterns were highly erratic. The winter was relatively dry until April. Precipitation was above average in April and May. June and July were extremely dry months. August, September, and October were extremely wet months.

Graphs of precipitation accumulation for the periods November 1, 1984 to April 30, 1985, and May 1, 1985 to October 31, 1985 for the climate station at Del Bonita are presented as Figures 14 and 15.

Streamflow Conditions

Spring snowmelt runoff produced near normal streamflow conditions in March and April throughout the basin including the Cypress Hills watersheds. Lack of rainfall from mid-May into July resulted in the natural flow of the Milk River going to virtually zero by mid-July, however. The actual flow during the summer was close to average most of the time with the U.S. diversion from the St. Mary River into the Milk River providing the water supply. In early July, the U.S. diversion was temporarily shut off for a period of several days for canal repair work with the result that the flow at Milk River almost went to zero for a period of more than a day. Once the repair work was completed and the diversion turned on again, the flow in the river recovered rapidly.

The Cypress Hills watersheds experienced several spring snowmelt runoff peaks as a number of wet snowstorms affected the area in April. The streams dried up in June as is often the case and flow remained nonexistent for most of the remainder of the season. Some flow was observed in September and October during the period of abnormally high rainfall.

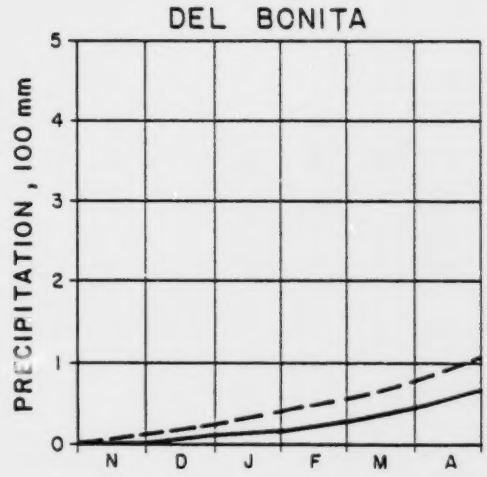
The hydrograph for the Milk River at Milk River is presented as Figure 16. The hydrograph for Lodge Creek, a key watershed in the Cypress Hills, is presented as Figure 17.

Water Supply Volume 1985

Water supply conditions for the Milk River in 1985 were less favourable than expected in the spring of 1985. The May 1985 forecast called for 55 percent of average natural flow for the April to September period. The actual natural flow volume for the season is now estimated at only 21 percent of average. The difference between the May forecast and the actual volume is attributed to the extremely dry weather which dominated from mid-May to mid-August.

Conditions for the Cypress Hills watersheds were considerably better in 1985 than expected before the spring snowmelt runoff season. The March forecast for Lodge Creek called for only 6 percent of average natural flow for the March to May period. The actual natural flow for this period is now estimated as 81 percent of average. This large difference is attributed in part to above average precipitation for the area in April and May. With the actual water supply from this area being close to normal, Alberta successfully met its commitments under the Master Agreement on Apportionment as regards the flows of Battle, Lodge and Middle Creeks.

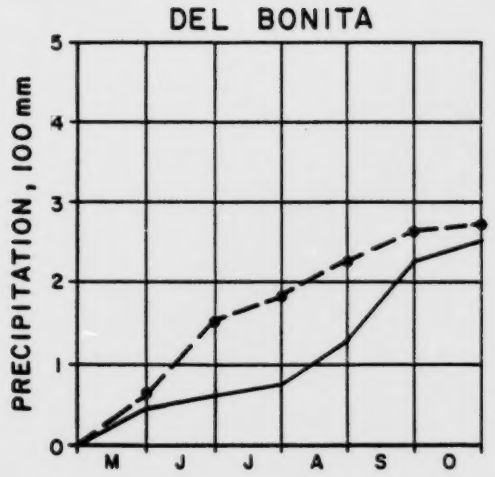
The 1985 water supply natural flow volume conditions are tabulated in Table 1.



LEGEND

– – – AVERAGE
——— 19 84/85

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED ..... DATE	DESIGNED ..... CHECKED	WINTER PRECIPITATION MILK RIVER BASIN
APPROVED	DRAWN	SCALE AS SHOWN



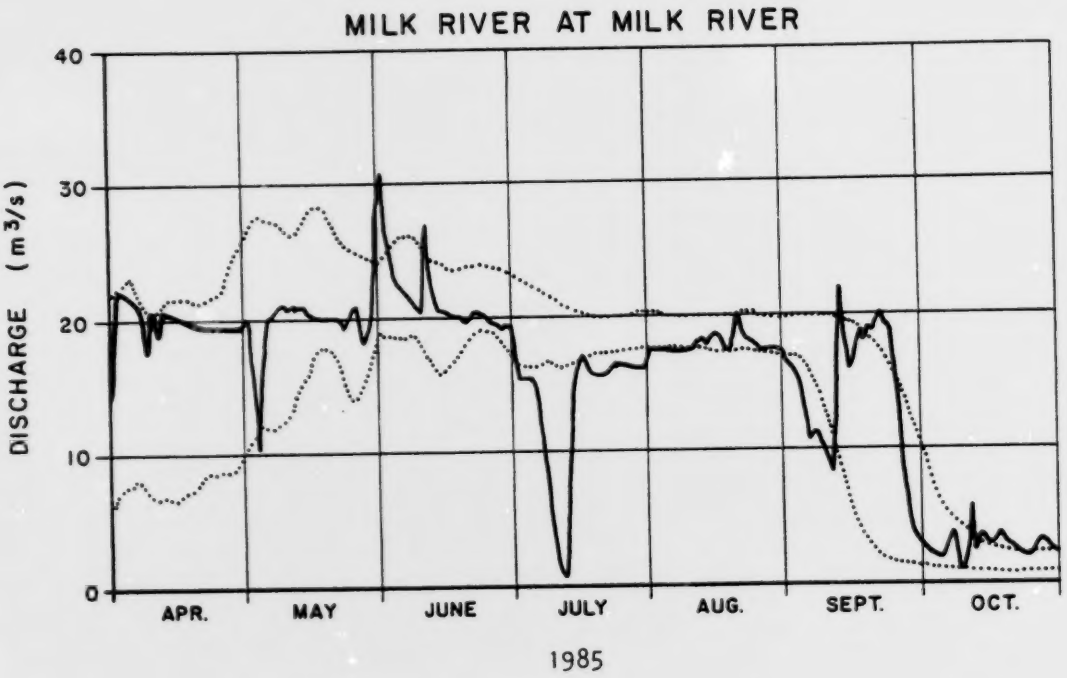
LEGEND

--- AVERAGE

—— 1985

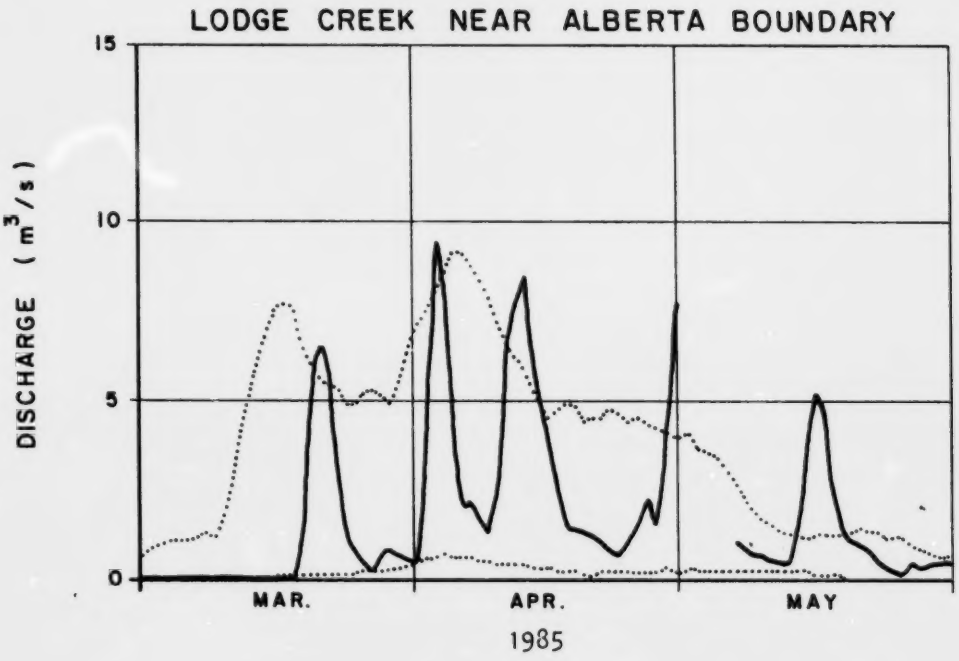
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	SUMMER PRECIPITATION MILK RIVER BASIN
APPROVED DATE	DRAWN R. Markley CHECKED	SCALE AS SHOWN DATE DEC., 1984

FIGURE 15 Page 22



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		STREAMFLOW HYDROGRAPH MILK RIVER	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN L. Mackay CHECKED	SCALE AS SHOWN DATE JAN., 1985	FIGURE 16



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		STREAMFLOW HYDROGRAPH MILK RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN L. Lindauer CHECKED	SCALE AS SHOWN DATE DEC. 1985	FIGURE 17 Page 24

OLDMAN RIVER BASIN 1985

Weather Conditions

Precipitation throughout the winter of 1984/85 was generally below average in the basin. The winter started much earlier than normal and snow which fell in the headwaters in September and October remained throughout the winter. The plains area snowpack was very light all winter and, as a result, the spring snowmelt runoff in the plains areas was minimal. By the end of April 1985, the mountain snowpack was slightly below normal, estimated at between 80 and 100 percent of average.

The trend of dry weather intensified in the spring and early summer. Rainfall in June was only 4 percent of average at Lethbridge and 28 percent of average at Pincher Creek. The northern part of the basin was generally drier than the southern part.

In mid-August, the weather turned wet and cool, and remained in this pattern until the end of October. Unusually heavy rainfall and early snowfalls occurred in the plains areas of the basin in September. September precipitation was 316 percent of average at Lethbridge and 400 percent of average at Pincher Creek.

Graphs of precipitation accumulation for several key stations in the basin for the winter period, November 1984 to April 1985, and for the summer season, May to October, are presented in Figures 18 and 19.

Streamflow Conditions

Spring runoff in the plains areas was very light, except in the eastern part of the basin where streams originating in the Cypress Hills experienced slightly above average runoff conditions. Snowmelt runoff from the headwaters peaked in late May and river levels generally receded quickly thereafter in the absence of any significant rainfall activity in June.

By mid-July, river levels in many parts of the basin were critically low. The lack of streamflow seriously hampered the operations of the Lethbridge Northern Irrigation District by restricting the rate at which water could be supplied to the district from the Oldman River. Low river levels also affected the irrigation operations of many individual irrigators taking their water directly from the Oldman, Waterton, Belly, and St. Mary Rivers or from Willow Creek. The Oldman River upstream of Lethbridge reached record low levels by mid-July and remained at these levels until late August.

The low streamflow conditions lasted until early September when heavy rainfall created abnormally high flow conditions for the time of year. By the end of October, streamflow conditions were generally normal to above normal throughout the basin.

Irrigation water demand was very high throughout most of the summer. River diversions to meet the demand were also extremely high in 1985.

Hydrographs for a number of key river and irrigation diversion stations are presented in Figures 20 to 25 which follow.

Water Supply Volume 1985

The actual summer water supply volumes were all less than expected in the spring of 1985. The spring forecasts assumed that summer precipitation would be close to normal. The difference between the forecasts and the actual volumes is a good indication of the dryness of the first half of the summer.

The seasonal totals do not accurately reflect the severity of the low water supply conditions in mid-summer, however, because of the wet autumn. The table below shows the May forecast, the actual April to September volume, and the July natural flow volume for 1985 as a percentage of average.

Water Supply Volume 1985 (cont'd)

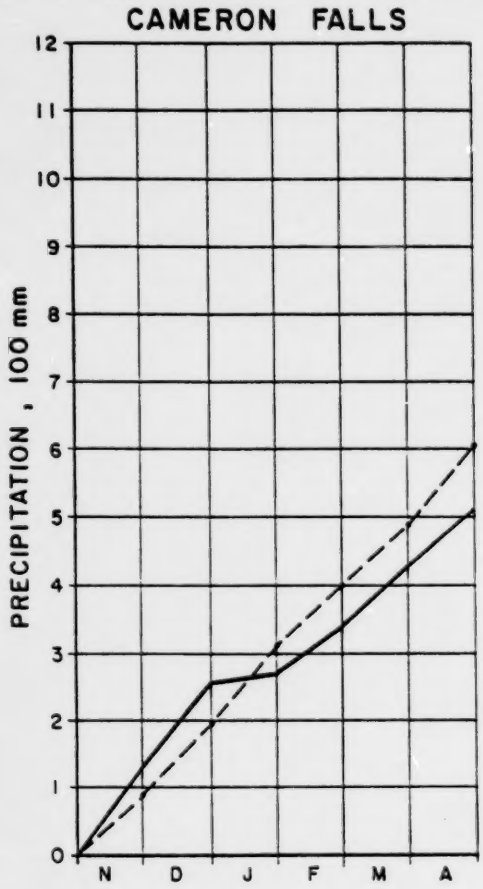
Station	May Forecast Apr-Sept 1985 Natural Flow Volume % of average	Actual Apr-Sept 1985 Natural Flow Volume % of average	Actual July 1985 Natural Flow Volume % of average
St. Mary River/Int'l Bndy.	86	81	54
Belly River near Mountainview	88	82	57
Waterton River at Waterton Park	85	79	44
Oldman River at Fort Macleod	85	54	30
Oldman River at Lethbridge	85	63	38

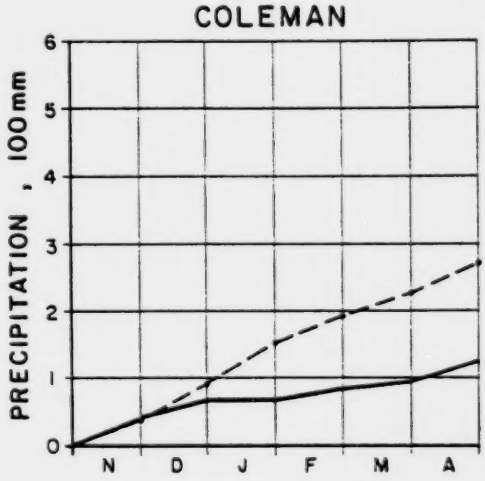
A more detailed presentation of the 1985 water supply conditions is given in Table 1.

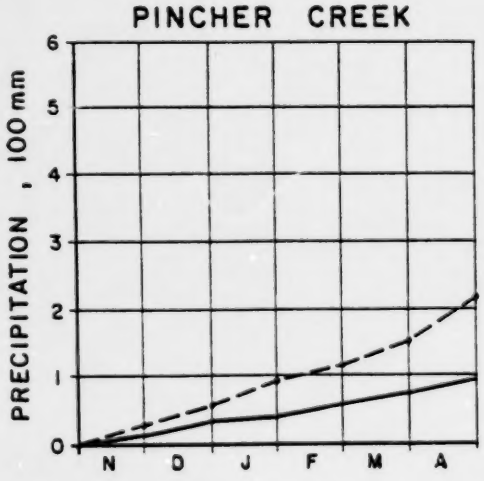
Water Storage Conditions

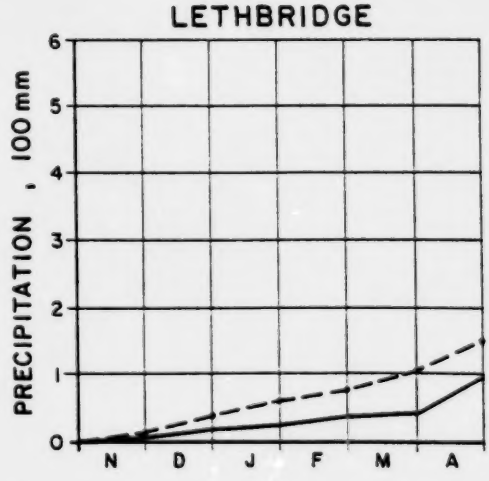
Storage facilities were generally at below average levels at the beginning of the irrigation season because of the dry summer of 1984. The dry weather and heavy water demand of early and mid-summer in 1985 caused some of the major reservoirs to reach dangerously low storage levels by mid-August. The wet autumn weather did much to refill water storage reservoirs so that levels were close to average by the end of October.

Graphs of the storage conditions since April are presented in Figure 26. A detailed account of the storage situation as of November 1, 1985 is presented in Table 2.









LEGEND

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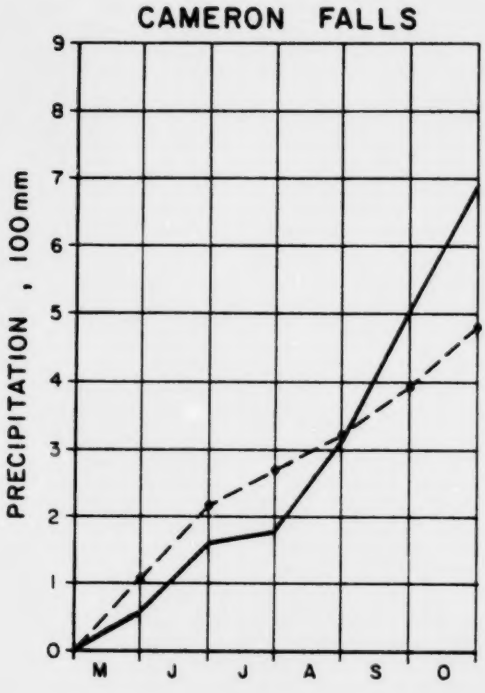
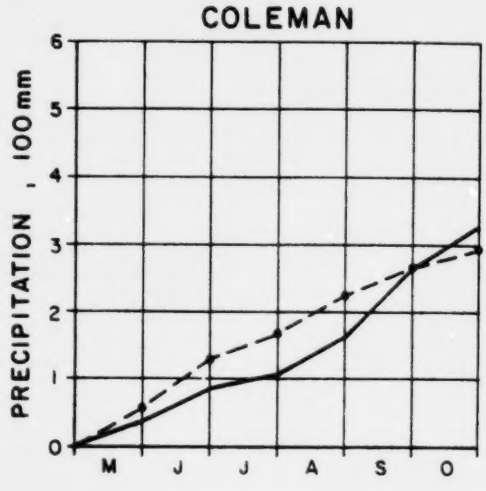
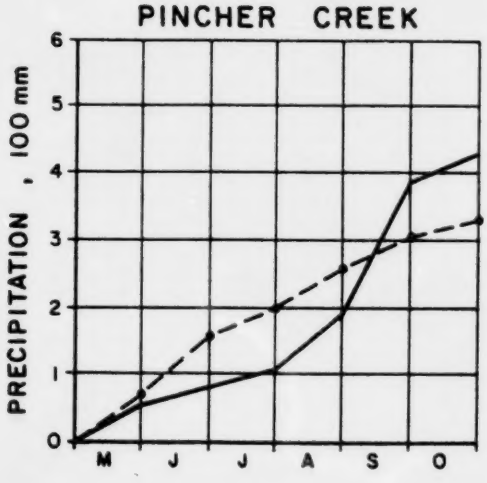
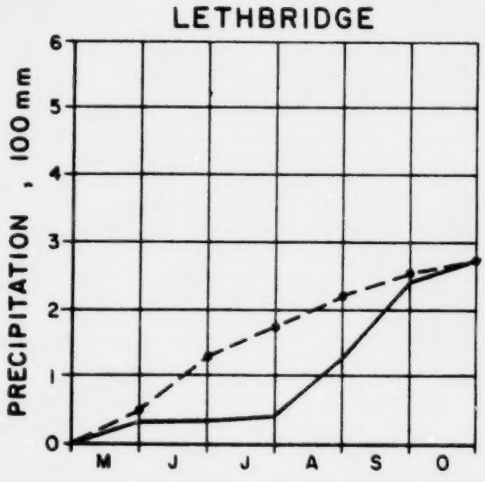
——— 19 84/85

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		WINTER PRECIPITATION OLDMAN RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE FEB., 1985	FIGURE 18









LEGEND

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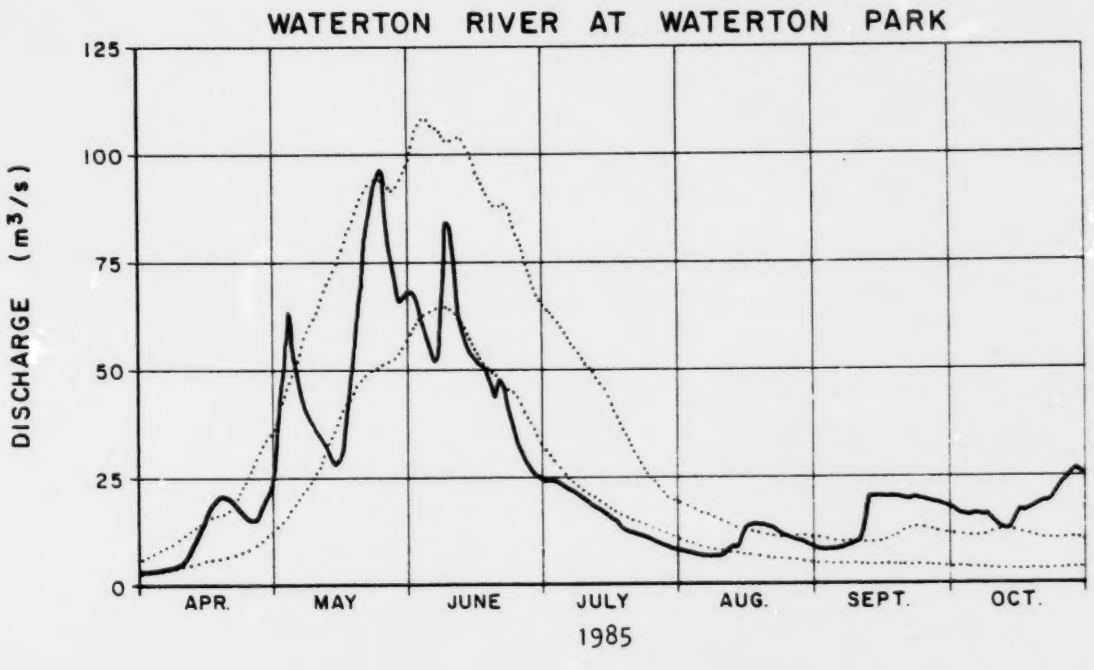
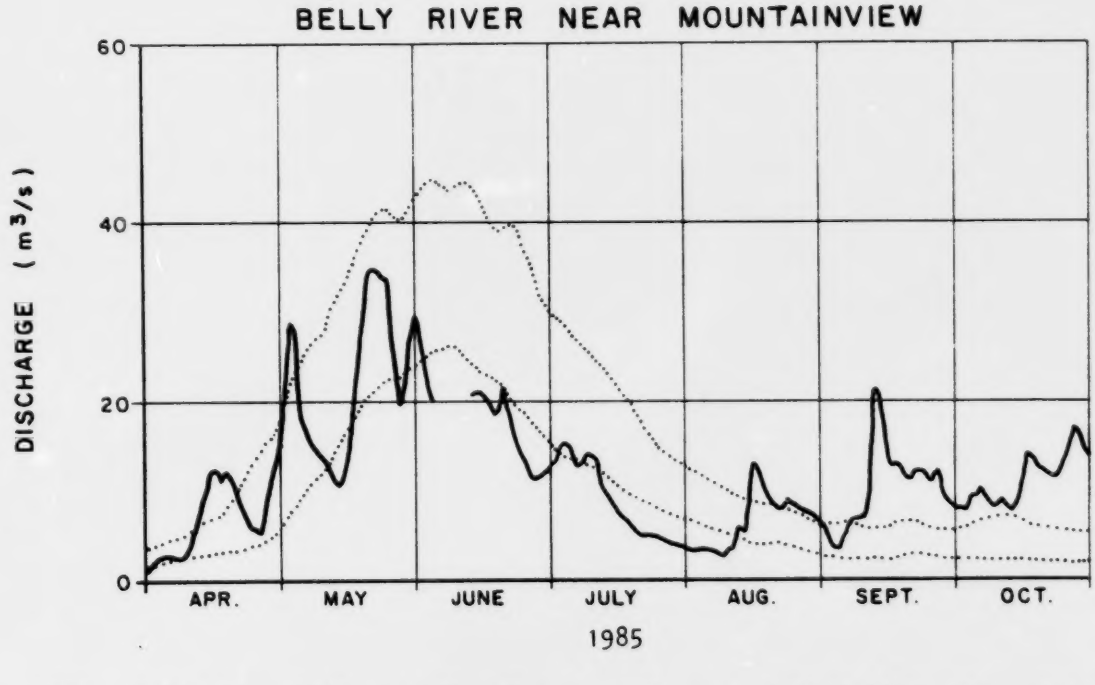
——— 1985

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	SUMMER PRECIPITATION OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984

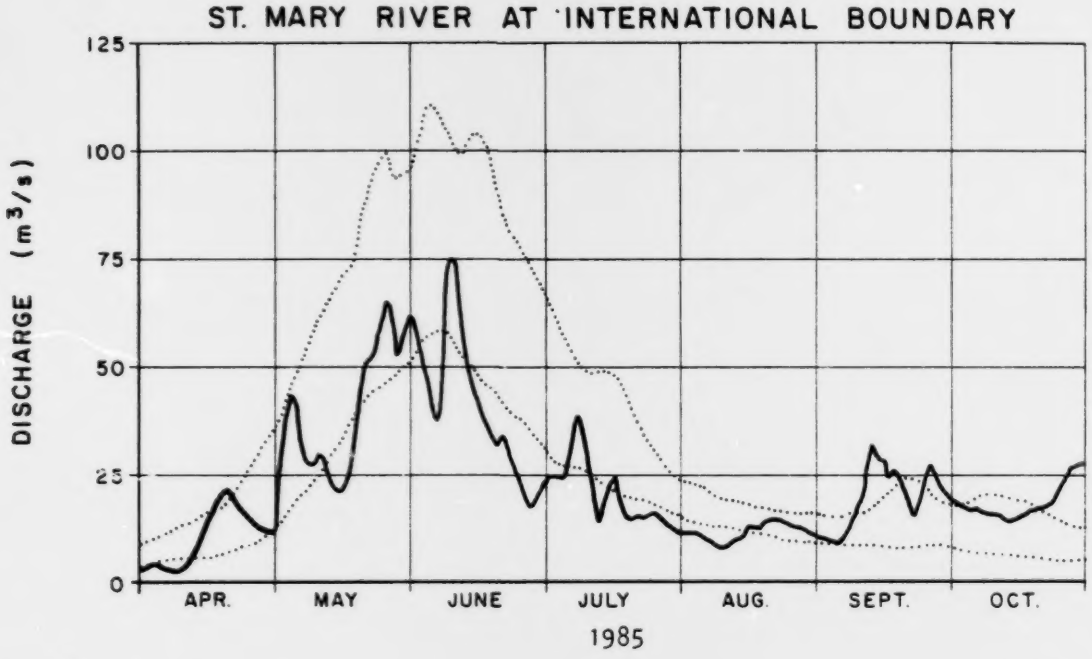
FIGURE 19 Page 28

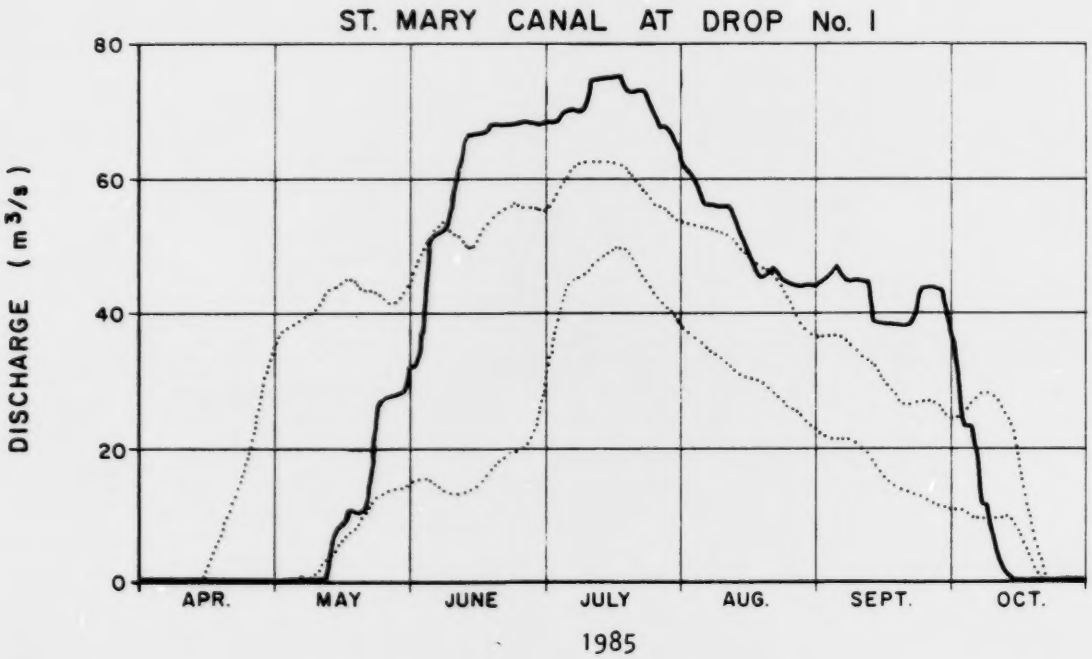




NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN. 1985

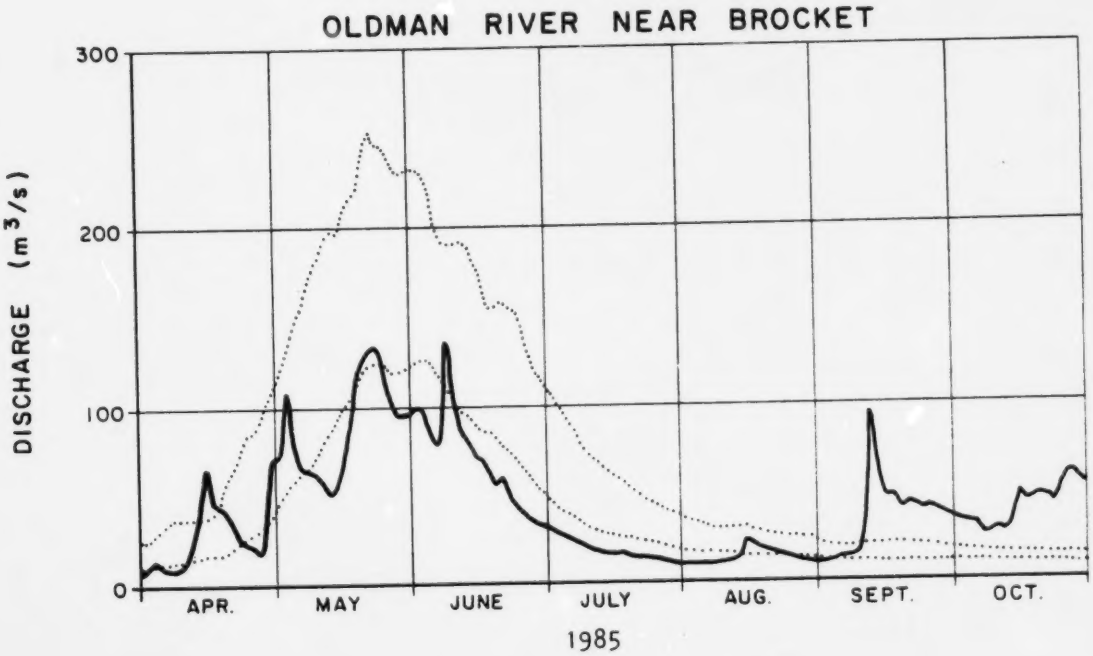


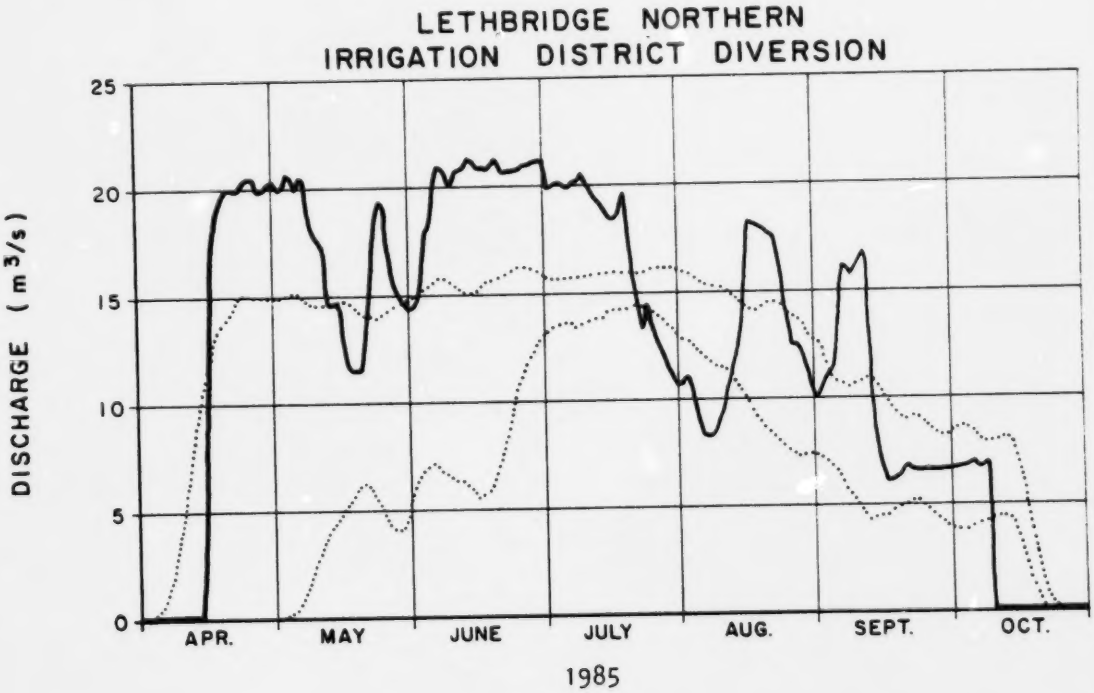


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN
	CHECKED	DATE JAN., 1985

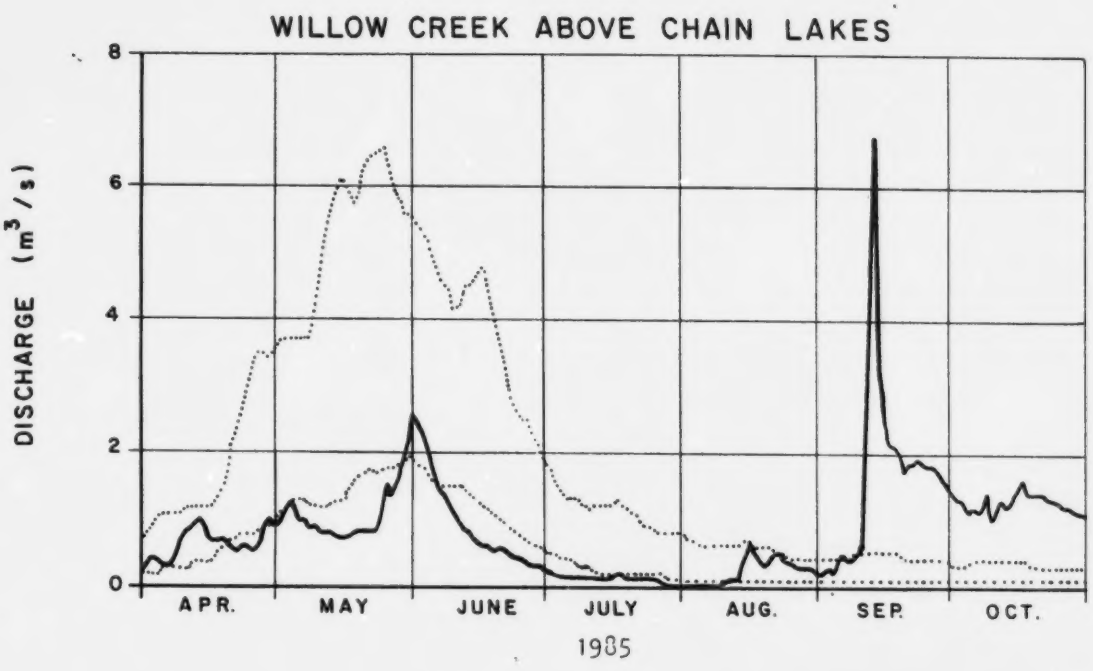
FIGURE 21 Page 30

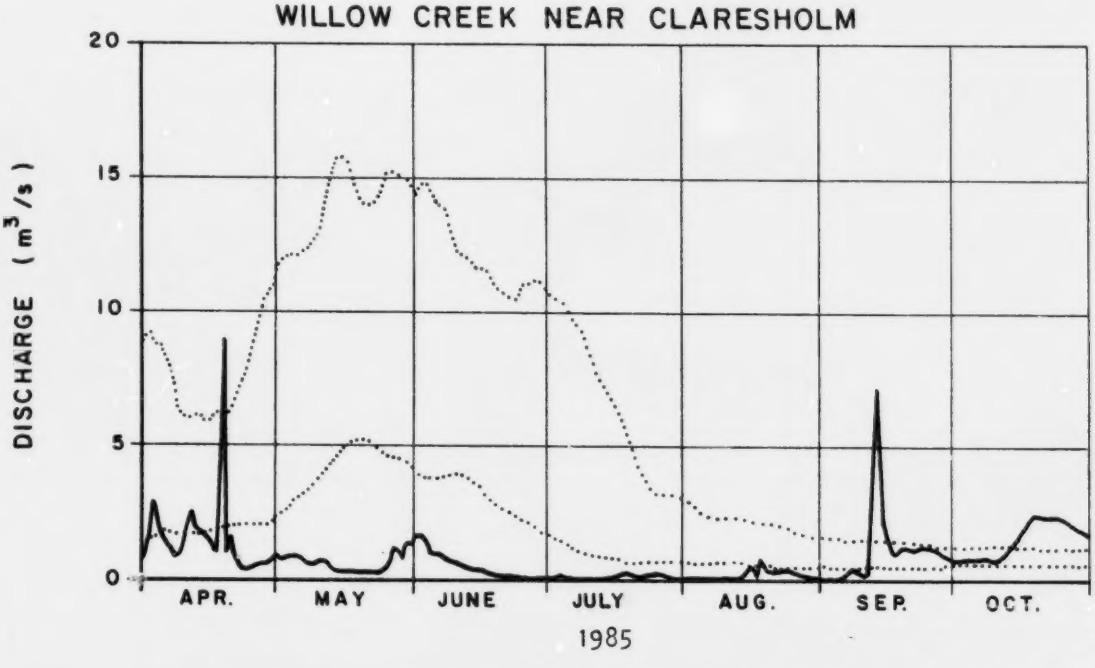




NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1985

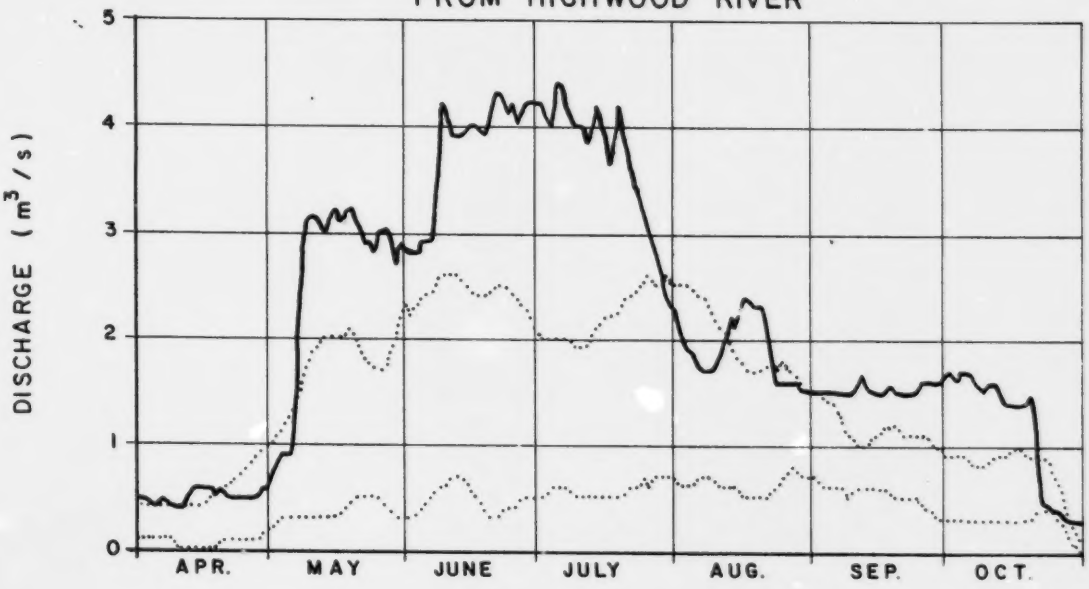




NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

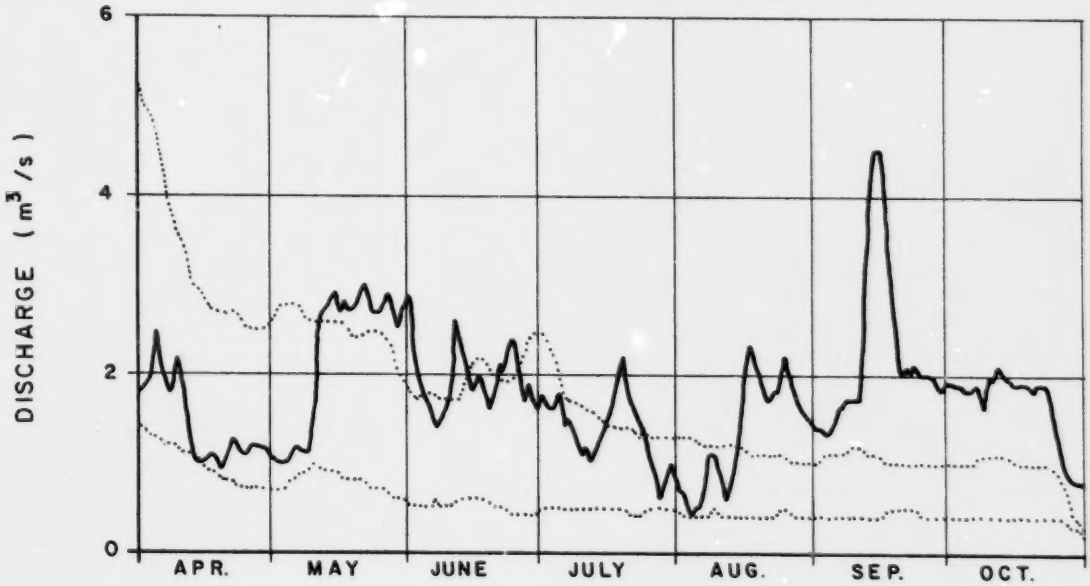
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN E. Swanson CHECKED	SCALE AS SHOWN DATE DEC., 1985	FIGURE 23 Page 32

TOTAL DIVERSION TO LITTLE BOW RIVER
FROM HIGHWOOD RIVER



1985

LITTLE BOW RIVER AT CARMANGAY

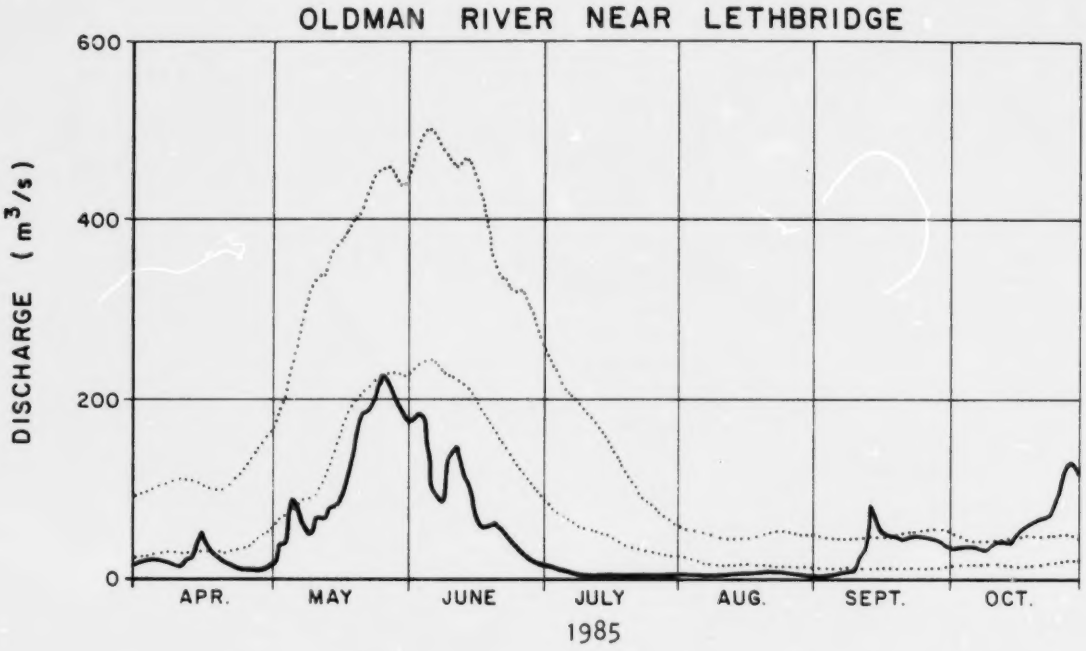


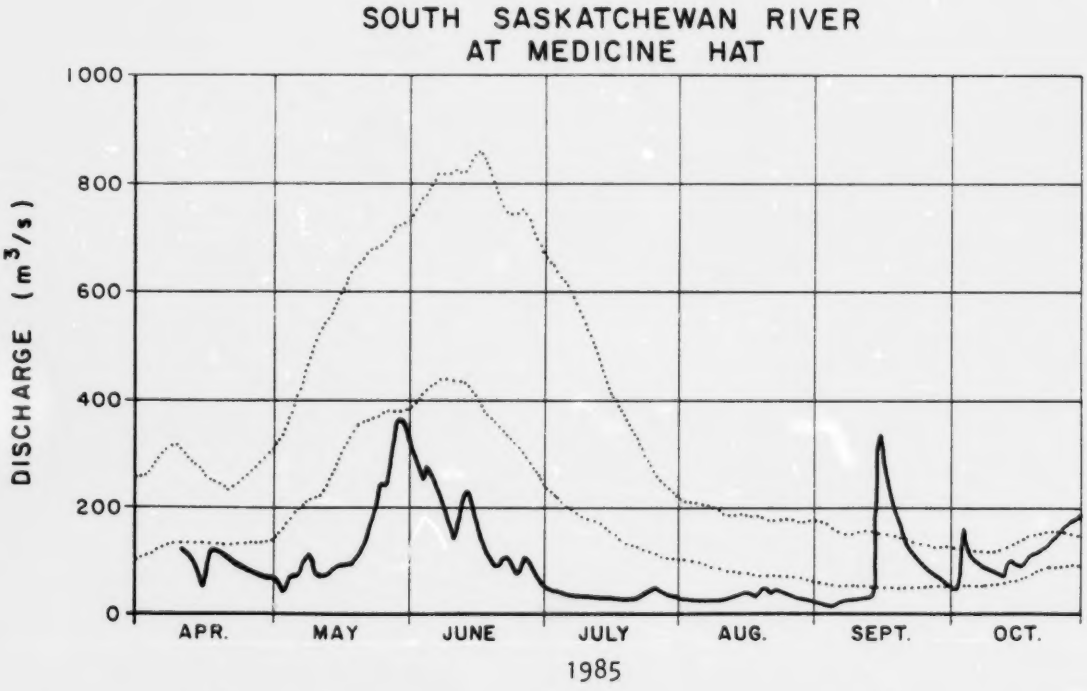
1985

NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN E. Steinbauer CHECKED	SCALE AS SHOWN DATE DEC., 1985

FIGURE 24 Page 33

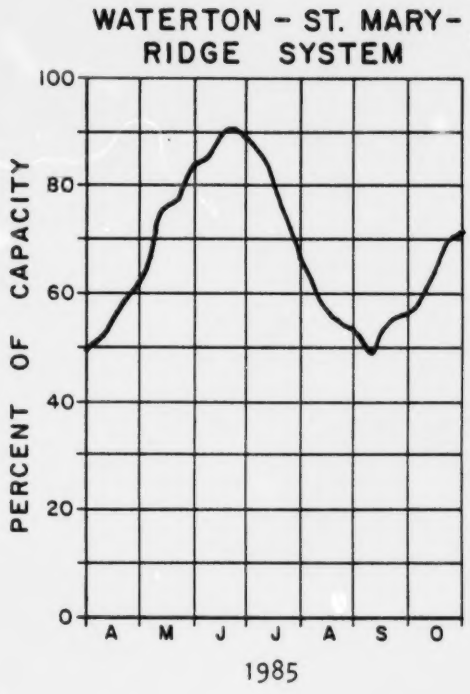


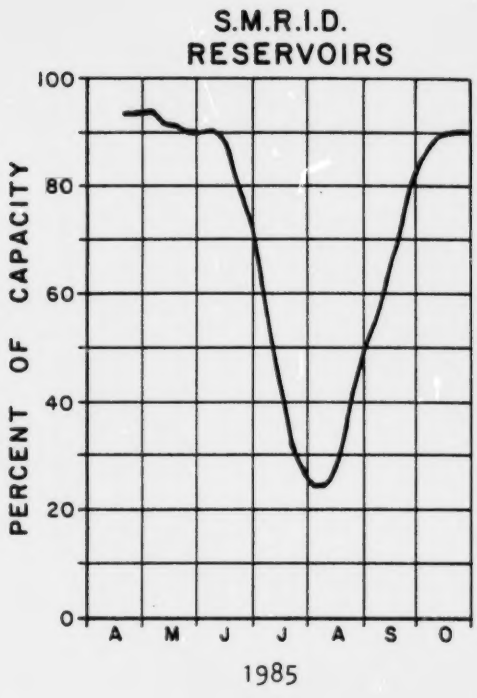


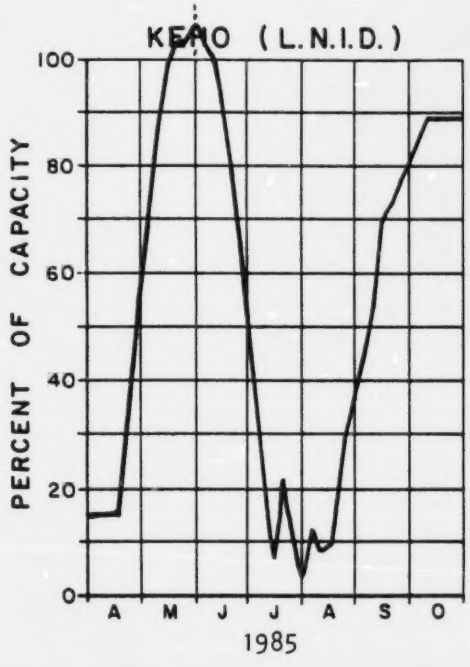
NOTE: Solid line indicates flow for current year: dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS OLDMAN RIVER BASIN
APPROVED DATE	DRAWN B. Sonderg	SCALE AS SHOWN DATE JAN., 1985

FIGURE 25







Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE OLDMAN RIVER BASIN	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 26 Page 35

BOW RIVER BASIN 1985

Weather Conditions

Winter began early in 1984. Heavy snowfalls occurred in the headwaters of the basin in September and October and the snow which fell stayed until the snowmelt period in May and June 1985. Precipitation from November 1984 to the end of April 1985 was generally below average throughout the basin with January 1985 being a particularly dry month. In that month, Banff recorded only 1 millimetre of precipitation while Calgary recorded only 3 millimetres.

The snowpack in the plains areas of the basin was relatively light throughout the winter. Spring snowmelt runoff in these areas was consequently below average. The mountain snowpack was slightly below average at the end of April but would have been much worse had it not been for the early snows of September and October.

The mountains snowpack melted rapidly in May. The trend of dry weather persisted from May to mid-August in the plains and foothills areas with one exception. May and June precipitation were close to normal in the areas around Banff and Lake Louise. In mid-August, the pattern changed to wet cool weather. In mid-September, a major storm hit areas in and around Calgary, producing the peak flow for the year on the Elbow and Highwood Rivers. Total precipitation for September at Calgary was 326 percent of average; at Pekisko in the Highwood River headwaters it was 298 percent of average. The above average precipitation trend persisted to the end of October.

Graphs of winter precipitation accumulation from November 1, 1984 to April 30, 1985, and summer precipitation accumulation from May 1 to October 31, 1985 for a number of key climate stations are presented as Figures 27 and 28.

Streamflow Conditions

After the peak period of mountain snowmelt runoff in late May, the major rivers in the basin receded throughout June. River levels from early June to mid-August were below normal because of below average rainfall. Rainstorm activity in mid-August improved river conditions slightly. Then, a major storm hit the foothills areas west and south of Calgary in mid-September, creating the peak streamflow conditions for the year on several streams including the Elbow and Highwood Rivers. River levels receded after this event but remained normal or above normal until the end of October.

Irrigation diversion rates were above average throughout the season. The combination of high rates of diversion and low natural streamflow resulted in record low streamflow levels in the Highwood River downstream of the Town of High River and in the Bow River downstream of the Bassano Dam in the months of July and August.

Hydrographs of several key river and irrigation diversion stations are presented in Figures 29 to 32 which follow.

Water Supply Volume 1985

In early May, the water supply for the Bow River basin was expected to be slightly below average during the summer of 1985. The actual natural flow volumes for the May to September period were generally lower than expected in May because of the lack of rainfall in May, June and July. The seasonal volumes do not accurately reflect the severity of the low streamflow conditions in mid-summer, however. July natural flow statistics are more indicative of these conditions. The following table compares the May forecasts with the actual seasonal volumes and the July natural flow.

Water Supply Volume 1985

Station	May Forecast May-Sept 1985 Natural Flow Volume % of average	Actual May-Sept 1985 Natural Flow Volume % of average	Actual July Natural Flow Volume % of average
Bow River at Banff	90	76	67
Bow River at Calgary	85	71	59
Elbow River	88	66	38
Highwood River	80	49	22
Lake Minnewanka Inflow	74	55	42
Spray Lake Inflow	82	75	59
Barrier Lake Inflow (Kananaskis River)	80	68	63

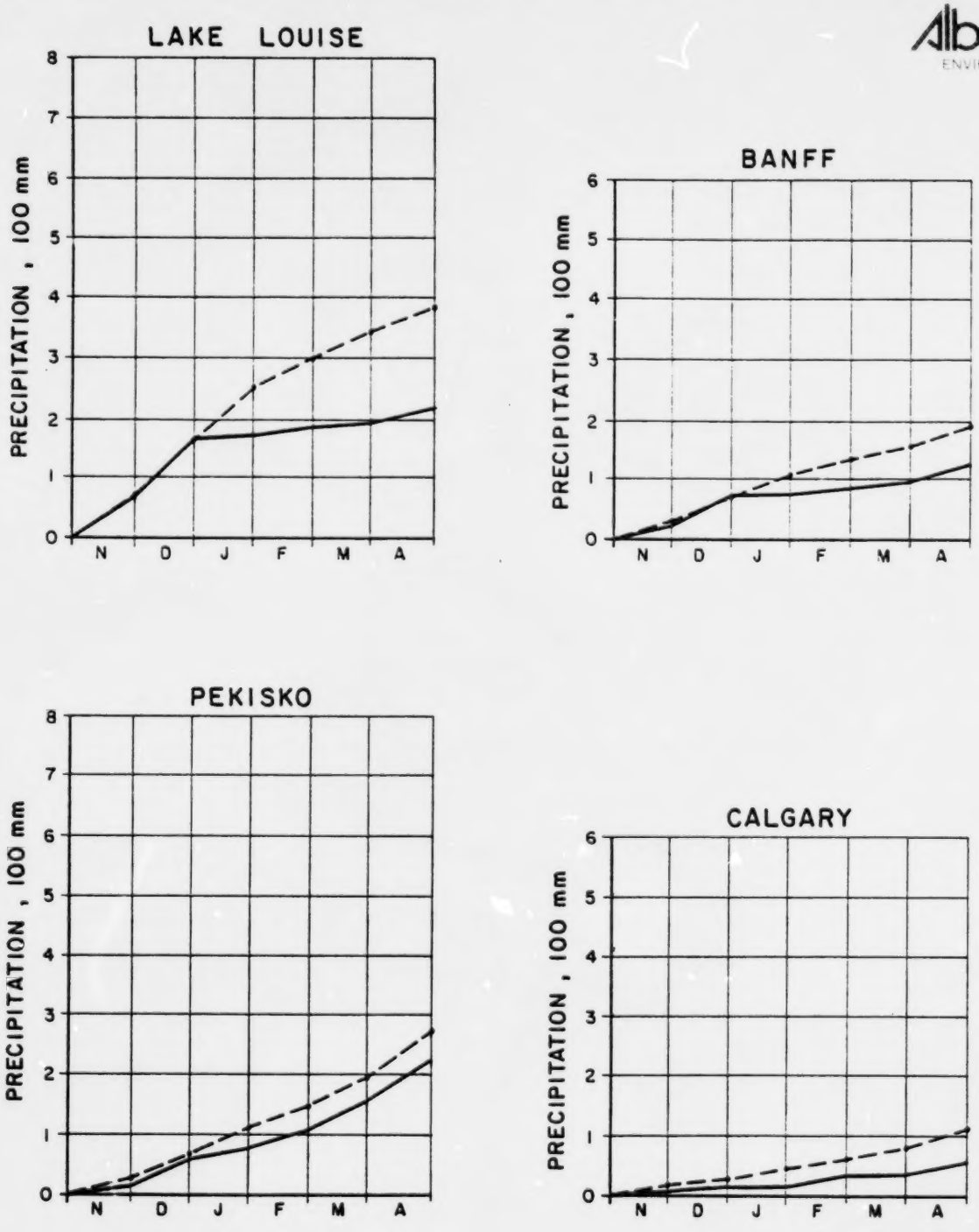
A more detailed presentation of the natural flow volumes is given in Table 1.

Water Storage Situation

Most of the water storage reservoirs in the basin began the 1985 irrigation season at normal levels. Heavy irrigation demand during the summer drew down some of the irrigation reservoirs to extremely low levels. This demand, coupled with the low natural flow situation, limited the rate at which the hydroelectric reservoirs in the headwaters could be refilled. The wet autumn was of great benefit to rebuilding storage levels in both the hydroelectric power and irrigation reservoirs.

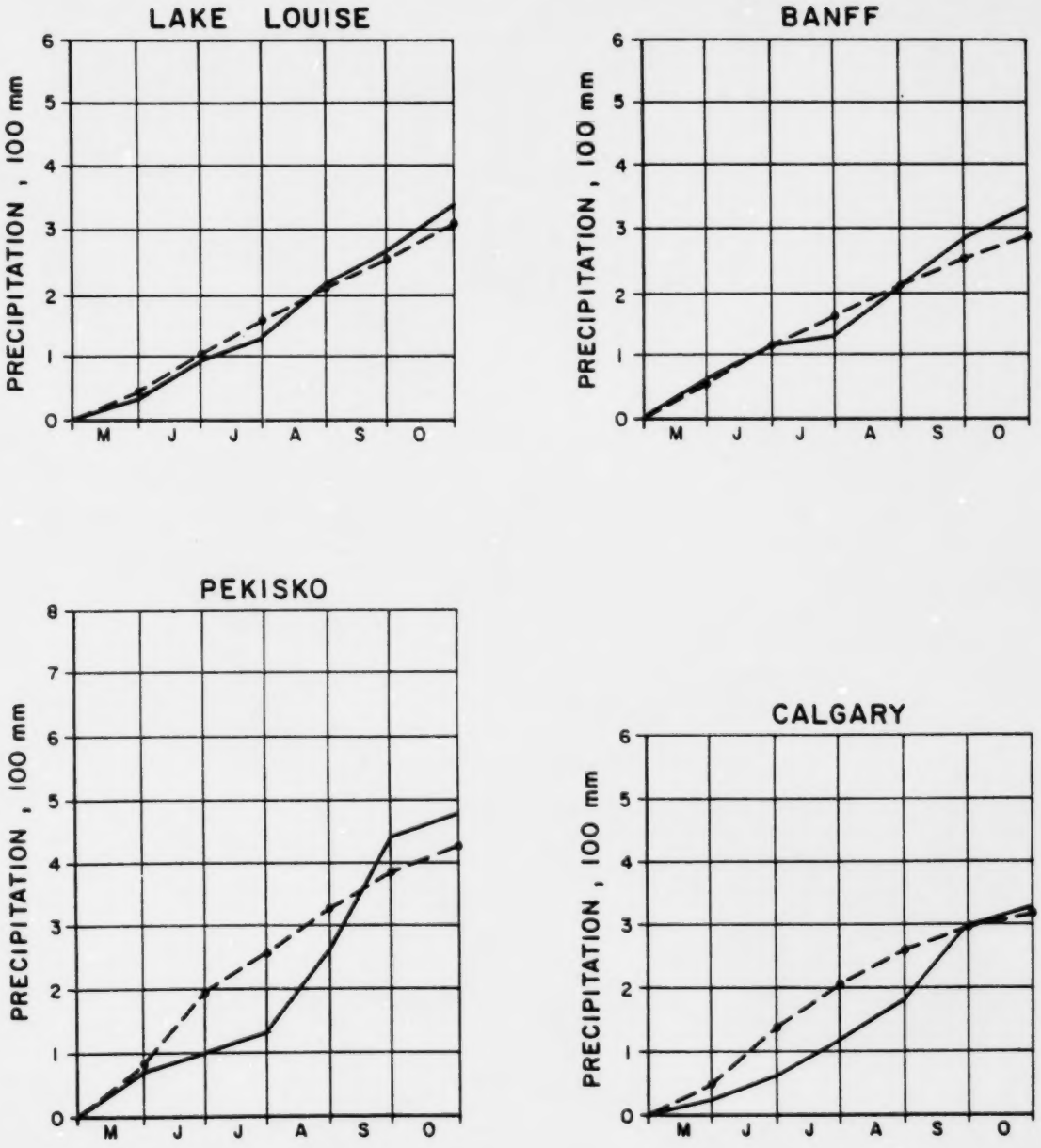
In 1985, the Eastern Irrigation District began to fill the Crawling Valley Reservoir for the first time. At the end of October, Crawling Valley was only partially filled but it is expected that this facility will be in routine operation in 1986.

Graphs of the storage conditions since April 1, 1985 are presented in Figure 33. A detailed account of the storage situation as of November 1, 1985 is presented in Table 2.

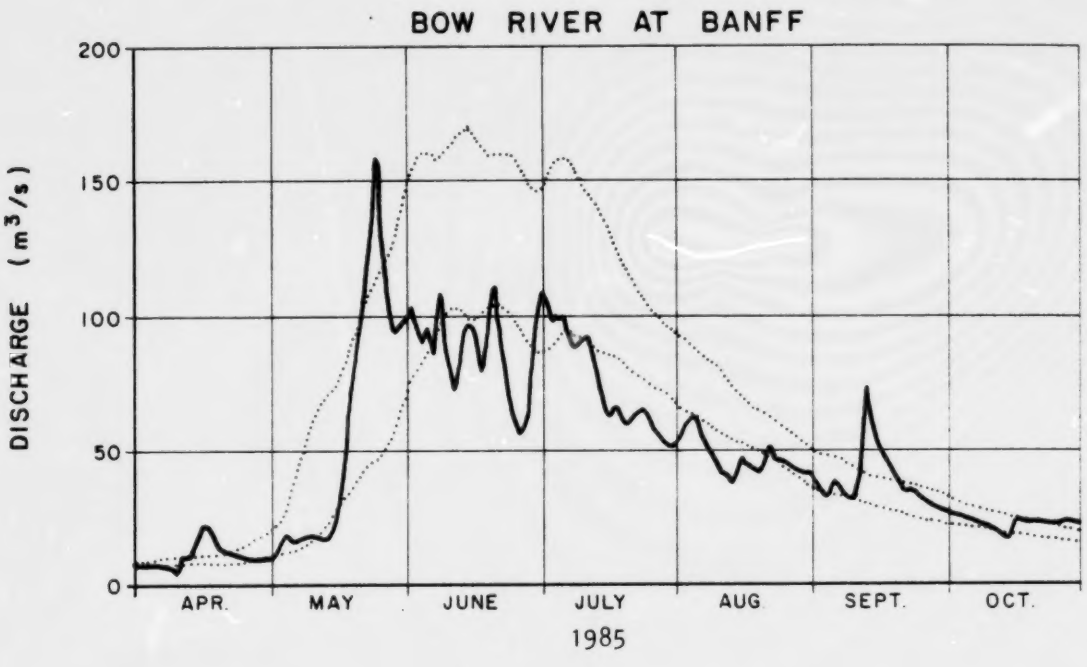


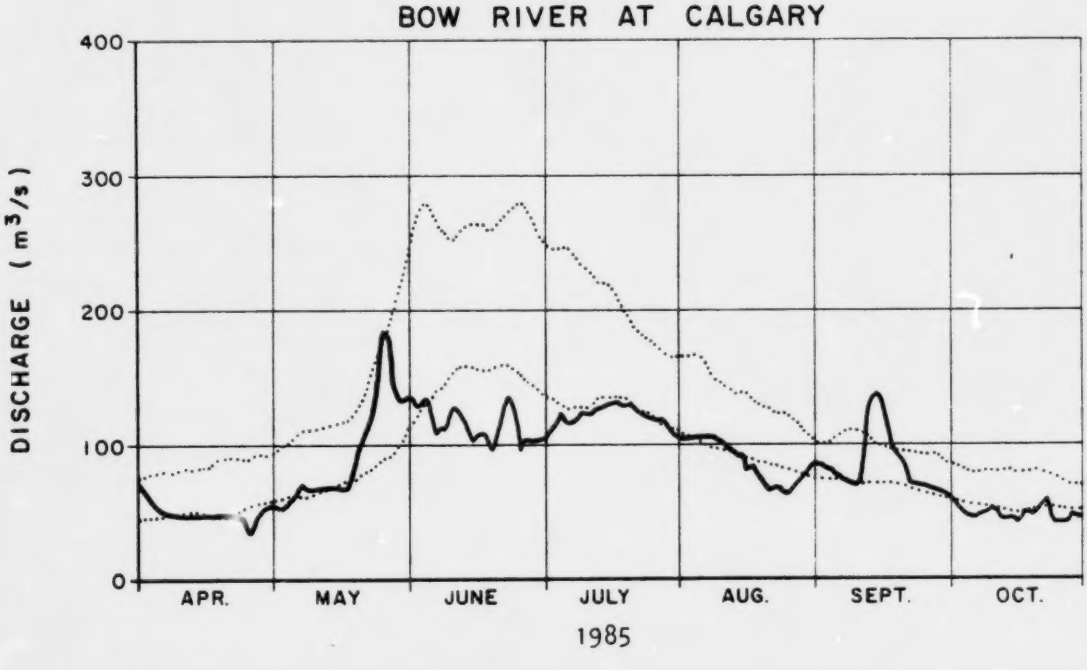
Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	WINTER PRECIPITATION BOW RIVER BASIN
APPROVED DATE	DRAWN B. Sowers REVISED	AS SHOWN FEB , 1985

FIGURE 27 Page 38



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		SUMMER PRECIPITATION BOW RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 28 Page 39

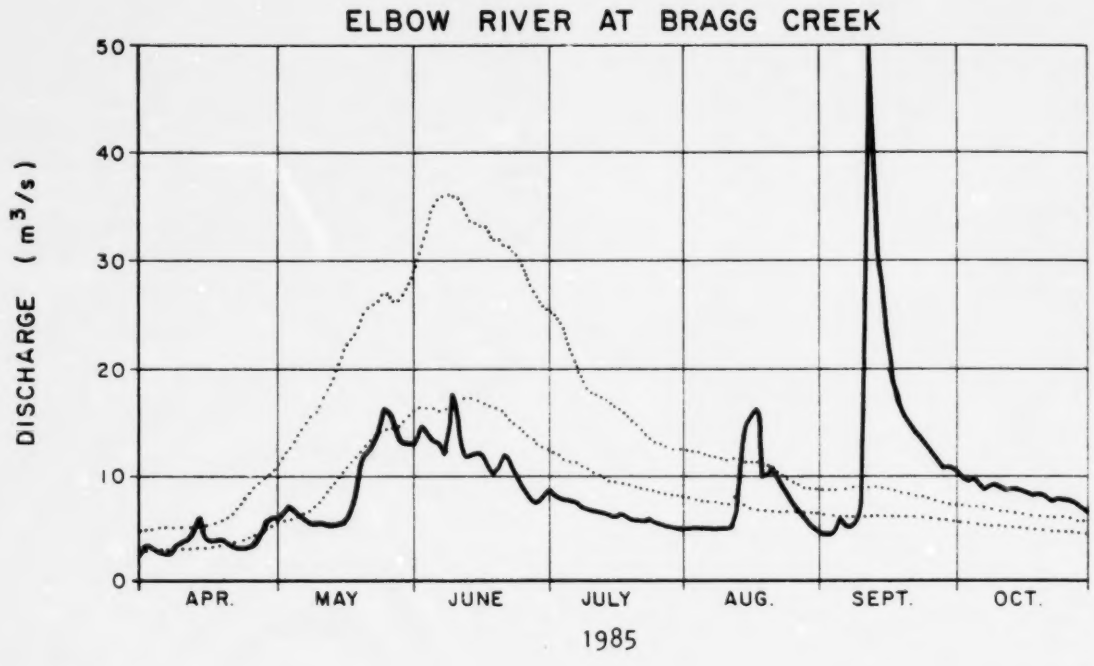


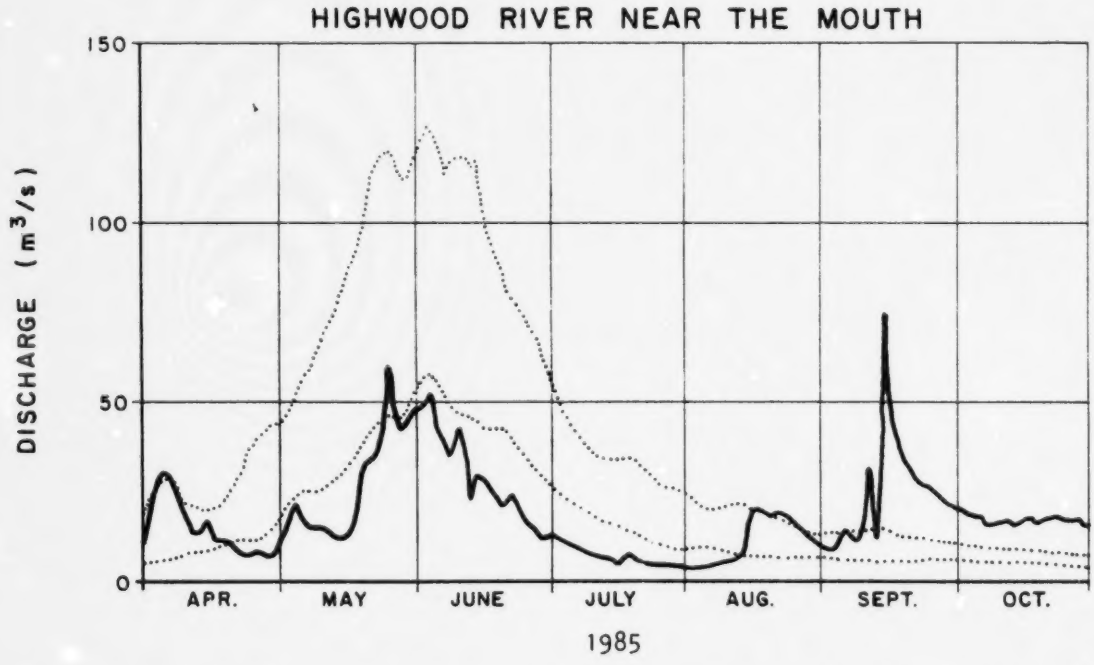


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1985

FIGURE 29 Page 40

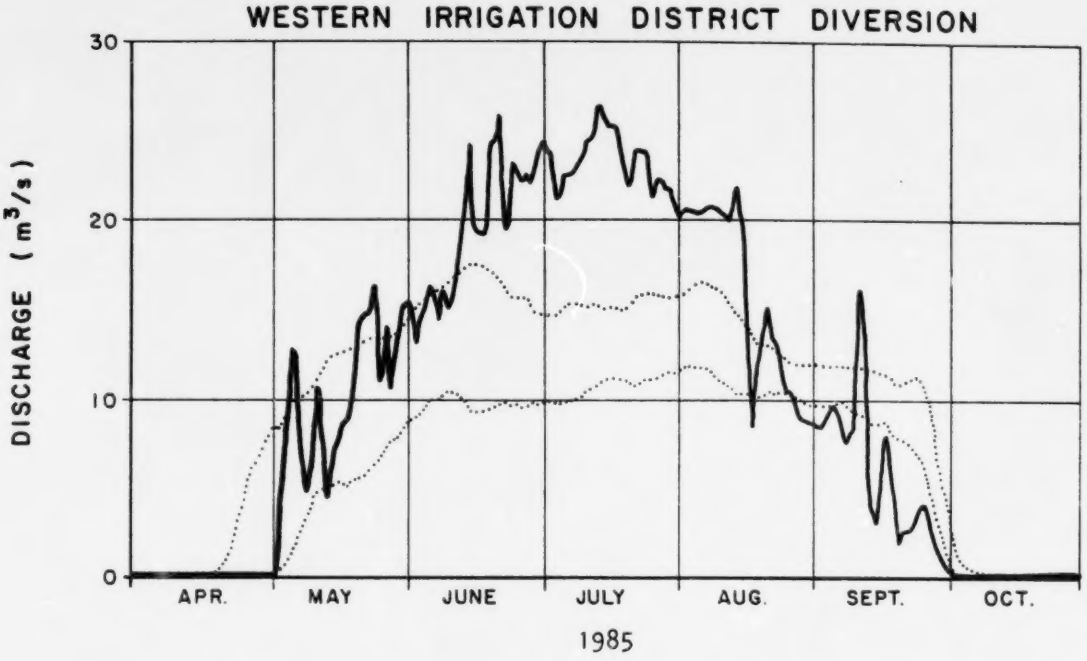


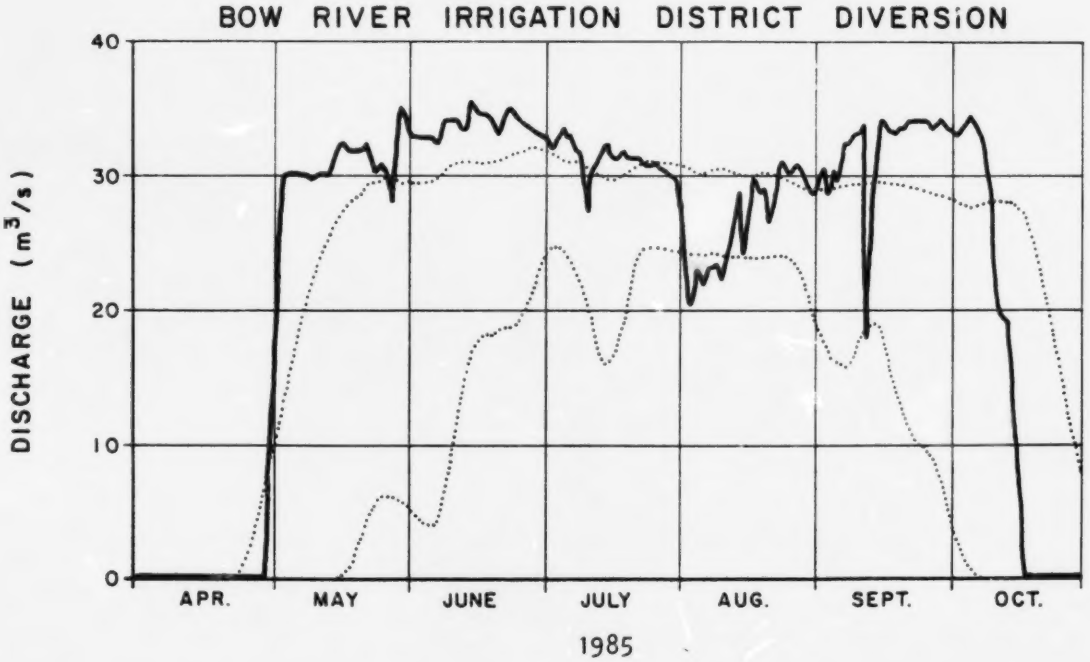


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1985

FIGURE 30

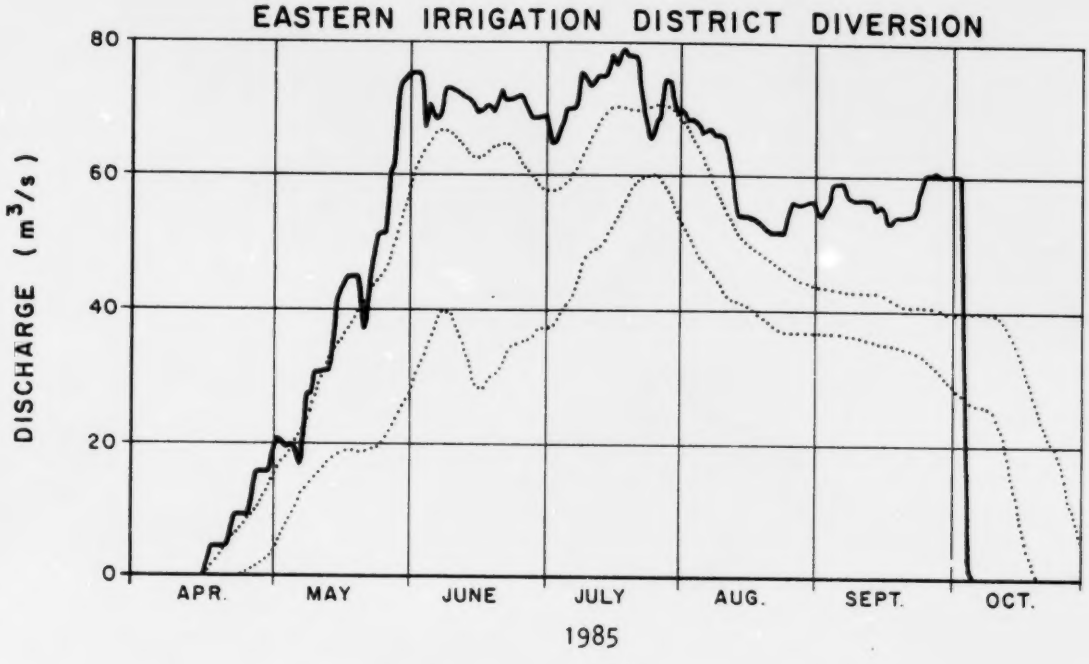


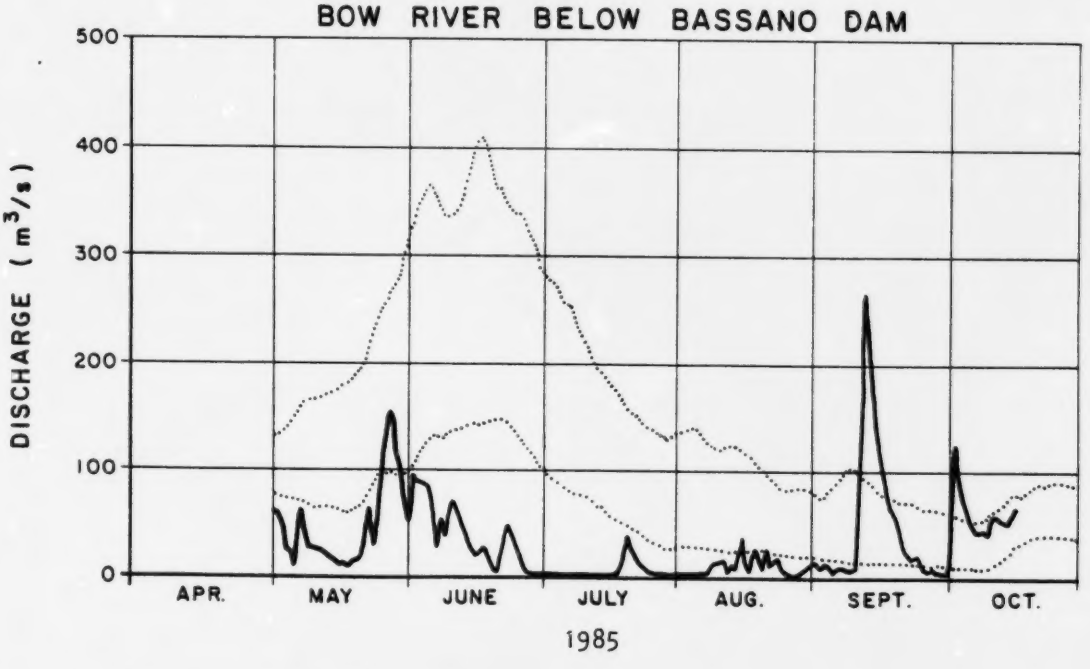


NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
		STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
SUBMITTED DATE	DESIGNED CHECKED	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE JAN., 1985

FIGURE 31 Page 42

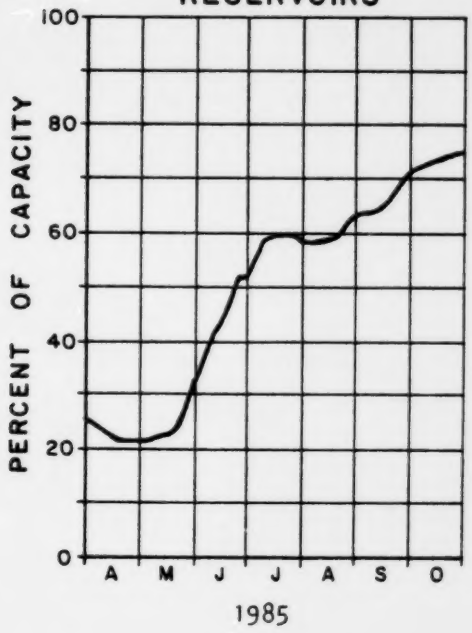




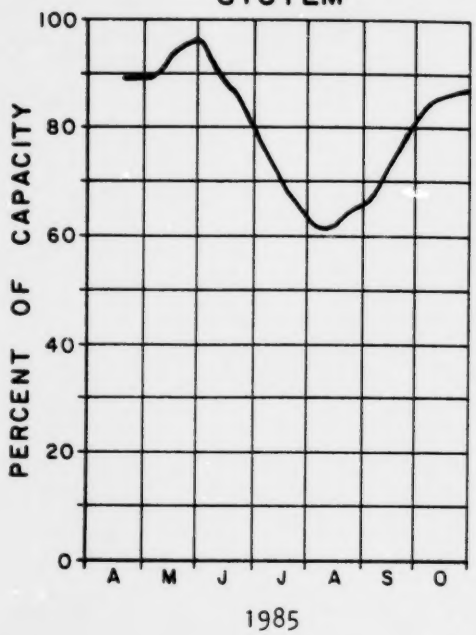
NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of normal range of behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED	STREAMFLOW HYDROGRAPHS BOW RIVER BASIN
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN
	CHECKED	FIGURE 32

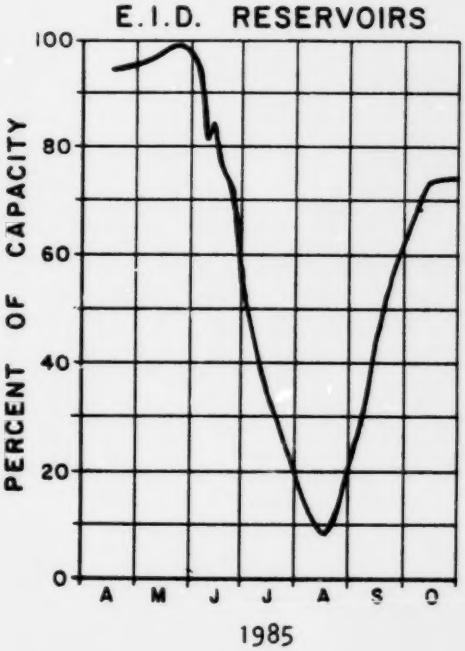
TRANSALTA BOW RIVER RESERVOIRS



McGREGOR - TRAVERS SYSTEM



E.I.D. RESERVOIRS



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE BOW RIVER BASIN	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 33

RED DEER RIVER BASIN 1985

Weather Conditions

The winter of 1984/85 began early with above average snowfalls in September and October. The period from November 1984 to April 1985 was one of generally below average precipitation. The plains area snowpack ranged from near normal in the western part of the basin to above average in the eastern section at the beginning of April. The mountain snowpack was considered to be slightly below average as of early May.

The dry trend continued from May to mid-August when the pattern shifted to cool wet weather. September precipitation was much above average with Sundre receiving almost three times the normal amount of rainfall for the month. Precipitation conditions returned to normal in October.

Graphs of precipitation accumulation for the climate stations at Sundre and Red Deer for the winter period, November 1, 1984 to April 30, 1985, and for the summer period, May 1 to October 31, 1985, are presented in Figures 34 and 35.

Streamflow Conditions

Spring snowmelt runoff was generally above average in the eastern part of the basin in April and close to normal in the western part. After the plains area snowmelt season, the foothills and mountain streams reached snowmelt peaks in late May and receded slowly after that time in the absence of any major rainstorm activity. Streamflow remained below average throughout June and July but recovered to normal conditions in late August with the onset of wet weather. A major storm in mid-September created the peak flow conditions for the year in the western part of the basin. By the end of October, streamflow conditions were generally normal throughout the basin.

Hydrographs for two key river stations in the basin are presented in Figure 36.

Water Supply Volume 1985

In early May, it was expected that summer water supply for the Red Deer River would be slightly below average. As a result of the dry weather from May to mid-August, the actual natural flow volume for the season was considerably less than expected. The flow volume for the May to September period is not truly indicative of the severity of the low supply situation in mid-summer, however, because of the high flows experienced in September.

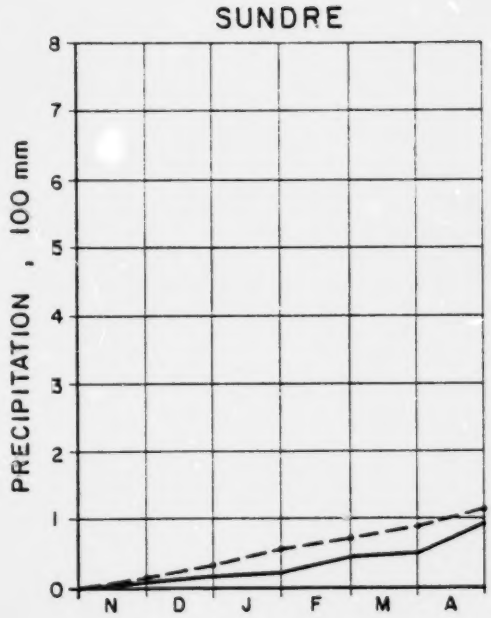
The table below shows the May forecasts for the basin, the actual May to September natural flow volumes, and the July natural flow volume as an indicator of mid-summer conditions.

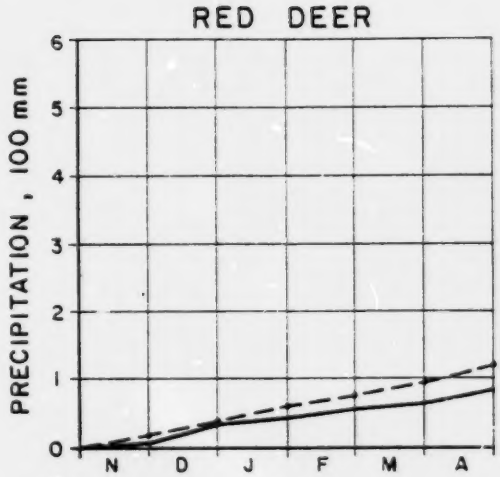
Station	May Forecast May-Sept 1985 Natural Flow Volume % of average	Actual May-Sept 1985 Natural Flow Volume % of average	Actual July 1985 Natural Flow Volume % of average
Gleniffer Lake Inflow (Dickson Dam)	90	50	39
Red Deer River at Red Deer	90	57	33

A more detailed presentation of the natural flow volumes is presented in Table 1.

Water Storage Situation

Even with much below average water supply, it was possible to fill Gleniffer Lake by the latter part of July this year. The lake remained at full supply level from that time to the end of October. A graph of the storage condition of the lake since April 1 is presented as Figure 37. A more detailed account of the situation is provided in Table 2.



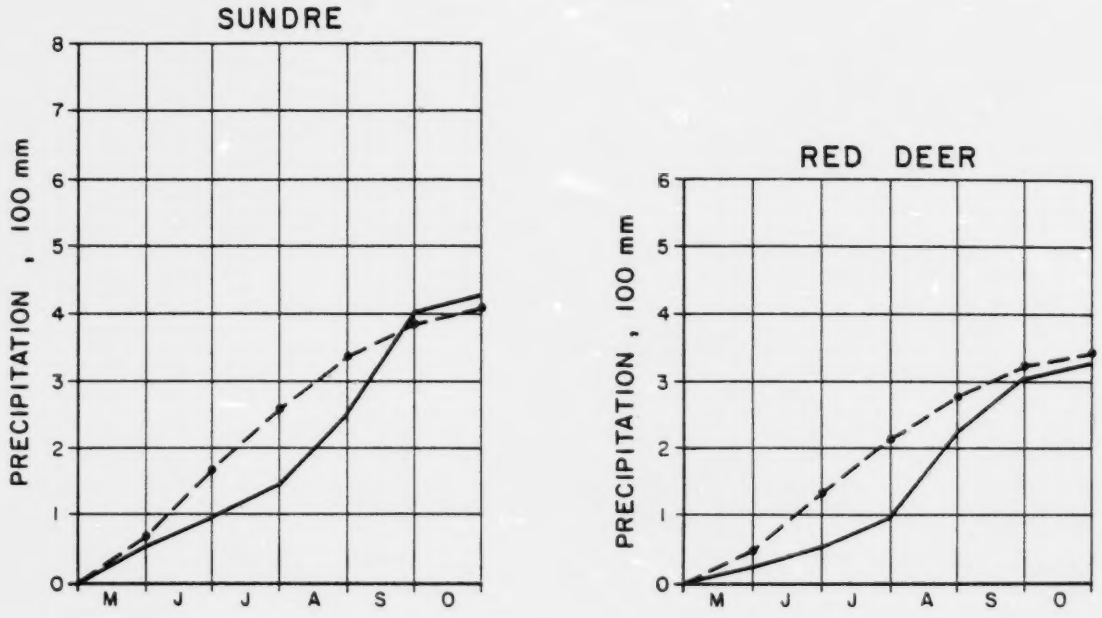


NOTE : SUNDRE AVERAGES ARE ESTIMATED.

LEGEND

——— AVERAGE
——— 19 84/85

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED	DESIGNED	WINTER PRECIPITATION RED DEER RIVER BASIN
DATE	DRAWN	SCALE AS SHOWN FIGURE 24 Page 47

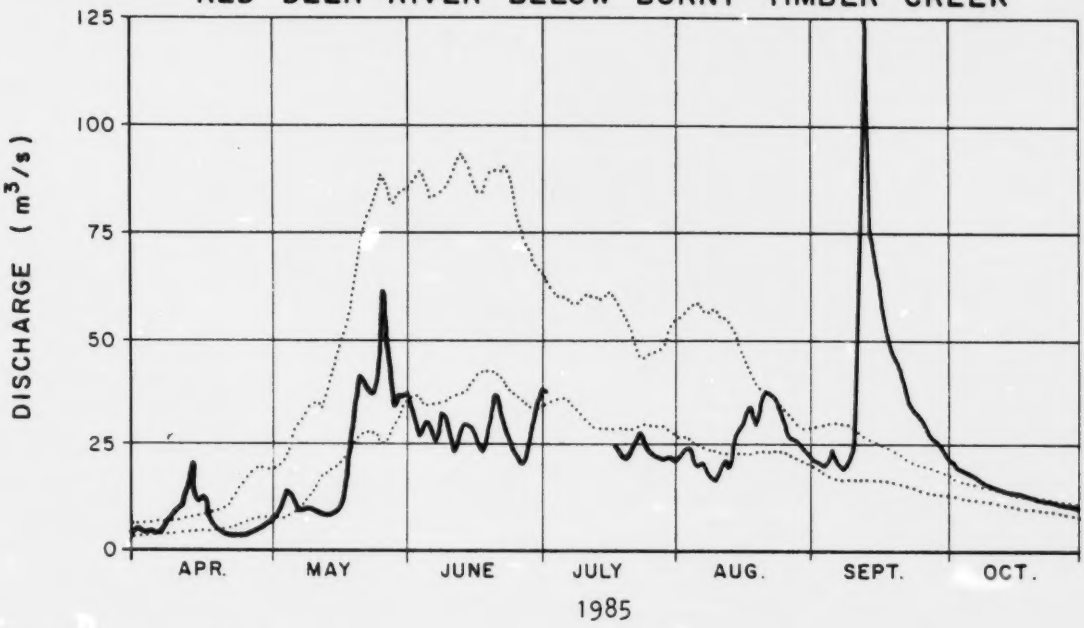


LEGEND

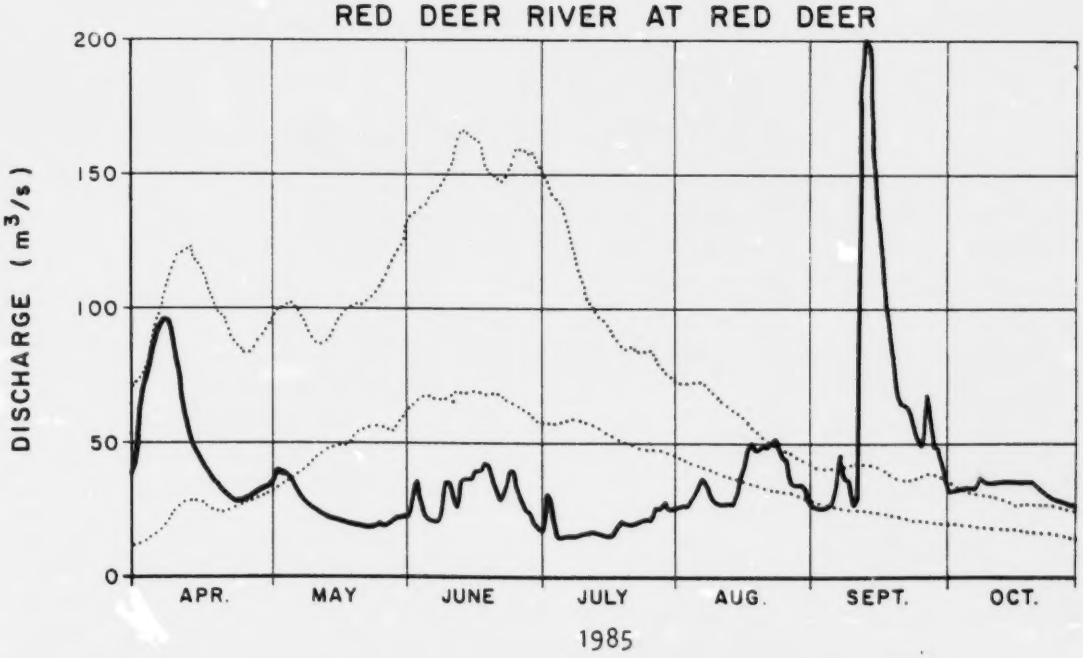
--- AVERAGE
——— 1985

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
SUBMITTED DATE	DESIGNED CHECKED	SUMMER PRECIPITATION RED DEER RIVER BASIN	
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC. 1984	FIGURE 35 Page 48

RED DEER RIVER BELOW BURNT TIMBER CREEK



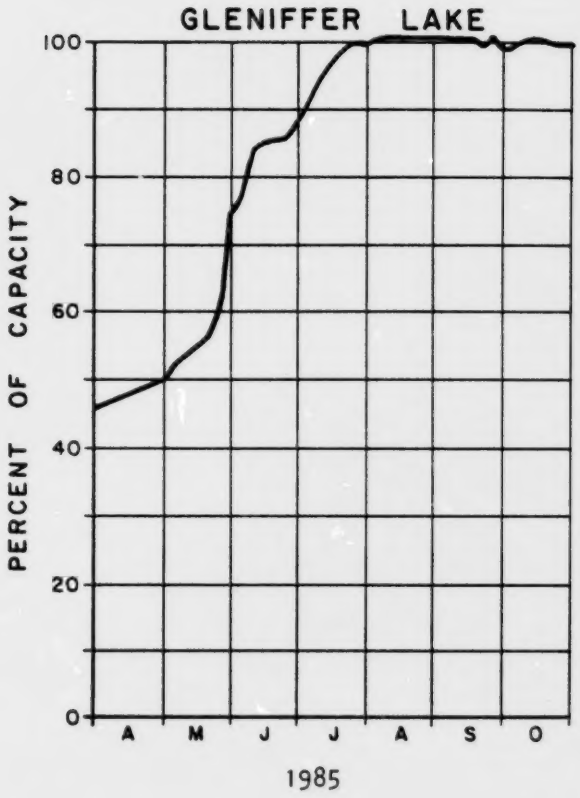
RED DEER RIVER AT RED DEER



NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of normal range of behaviour.

Alberta ENVIRONMENT — RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED	STREAMFLOW HYDROGRAPHS RED DEER RIVER BASIN
APPROVED DATE	DRAWN B. Sanders	SCALE AS SHOWN
		DATE JAN., 1985

FIGURE 36 Page 49



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	RESERVOIR STORAGE RED DEER RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984

FIGURE 37 Page 50

NORTH SASKATCHEWAN RIVER BASIN 1985

Weather Conditions

September and October of 1984 were cold and much above average in terms of precipitation. From early November on, however, precipitation was generally below average in the headwaters of the basin until August 1985. In the plains areas, winter snowfall was about average. By early March, the plains area snowpack in some parts of the basin was heavy enough that warnings of possible spring flooding were issued. The mountain snowpack at the end of April was considered to be slightly below average.

May, June and July were relatively dry months with the exception of one large rainstorm in late June which primarily affected areas around Edmonton. In mid-August, the weather pattern shifted to a cool wet trend which persisted into October. The headwaters areas were affected by the major storm which hit southern and central Alberta in mid-September. The total precipitation for the month of September at Rocky Mountain House was 290 percent of average.

Graphs of precipitation accumulation for Rocky Mountain House and Edmonton for the winter period from November 1, 1984 to April 30, 1985, and for the summer period from May 1 to October 31 are presented as Figures 37 and 38.

Streamflow Conditions

Spring snowmelt runoff in April was above average for many parts of the plains area in the basin. Some minor flooding was reported from areas north of Edmonton. After the spring melt, the North Saskatchewan River receded until the melt period for the mountain snowpack which occurred in late May. The headwaters streams receded gradually from the snowmelt peak in the absence of any significant rainstorm activity. River levels at Edmonton were generally well below average throughout the summer because of the combined effect of lack of rainfall and conservative operation of the hydroelectric power plants in the basin headwaters. In August, river levels recovered to normal conditions with the onset of wet weather. The highest flow rates for the year at both Rocky Mountain House and Edmonton occurred as a result of the mid-September storm. After this event, the rivers stayed at or above normal levels until the end of October.

Hydrographs for the North Saskatchewan River at Rocky Mountain House and at Edmonton are presented in Figure 39.

Water Supply Volume 1985

In May, with slightly below average mountain snowpack conditions, it was expected that the summer water supply would be about 90 percent of average. The lack of summer rainfall resulted in the production of less natural flow volume than predicted. The water supply situation for the season would have been much worse had it not been for the unusual rainstorm in mid-September. The table which follows compares the May water supply forecasts to the actual April to September natural flow volumes as well as to the July flow volume.

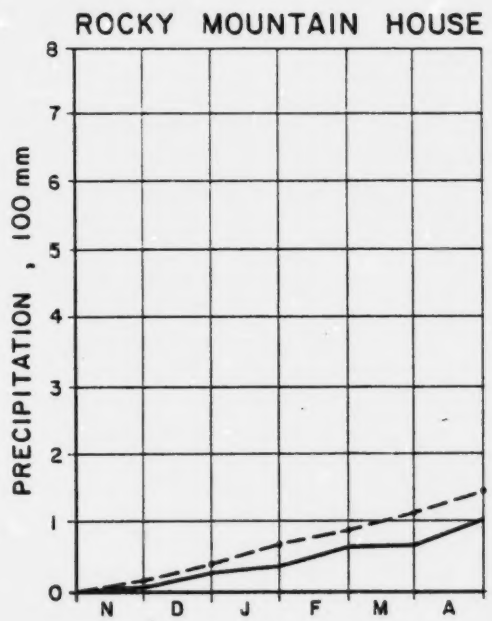
Water Supply Volume 1985 (cont'd)

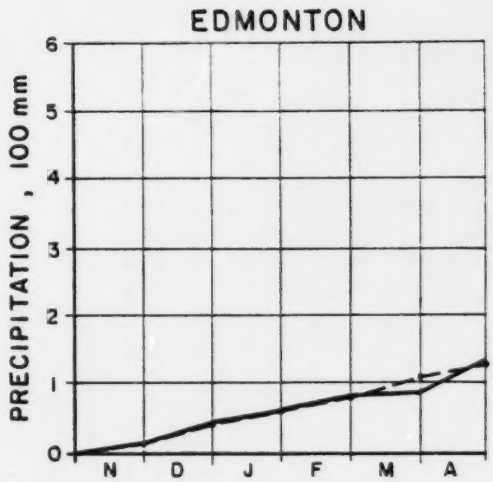
Station	May Forecast Apr-Sept 1985 Natural Flow Volume % of average	Actual Apr-Sept 1985 Natural Flow Volume % of average	Actual July 1985 Natural Flow Volume % of average
North Saskatchewan River at Bighorn Dam	90	83	87
Brazeau River at Brazeau Dam	95	78	56
North Saskatchewan River at Edmonton	87	72	62

A more detailed account of the natural flow conditions is presented in Table 1.

Water Storage Situation

Lake Abraham and the Brazeau Reservoir began the summer season at lower levels than in past years due to some changes in operational strategy. By the end of October, Lake Abraham had not attained its normal end-of-season level. The Brazeau Reservoir was able to attain its normal autumn level primarily as a result of the rainstorm of mid-September. A graph of the total storage in Lake Abraham and the Brazeau Reservoir since April is presented as Figure 40. A detailed account of the storage situation as of November 1, 1985 is given in Table 2.



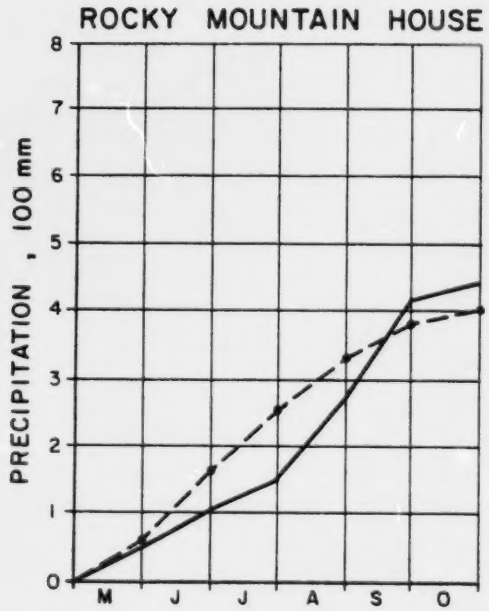


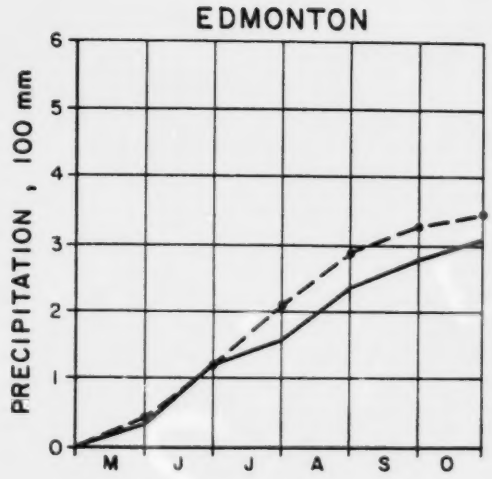
LEGEND

---- AVERAGE

——— 19 84/85

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		WINTER PRECIPITATION NORTH SASKATCHEWAN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B Edwards	SCALE AS SHOWN DATE FEB., 1985	FIGURE 38 Page 53





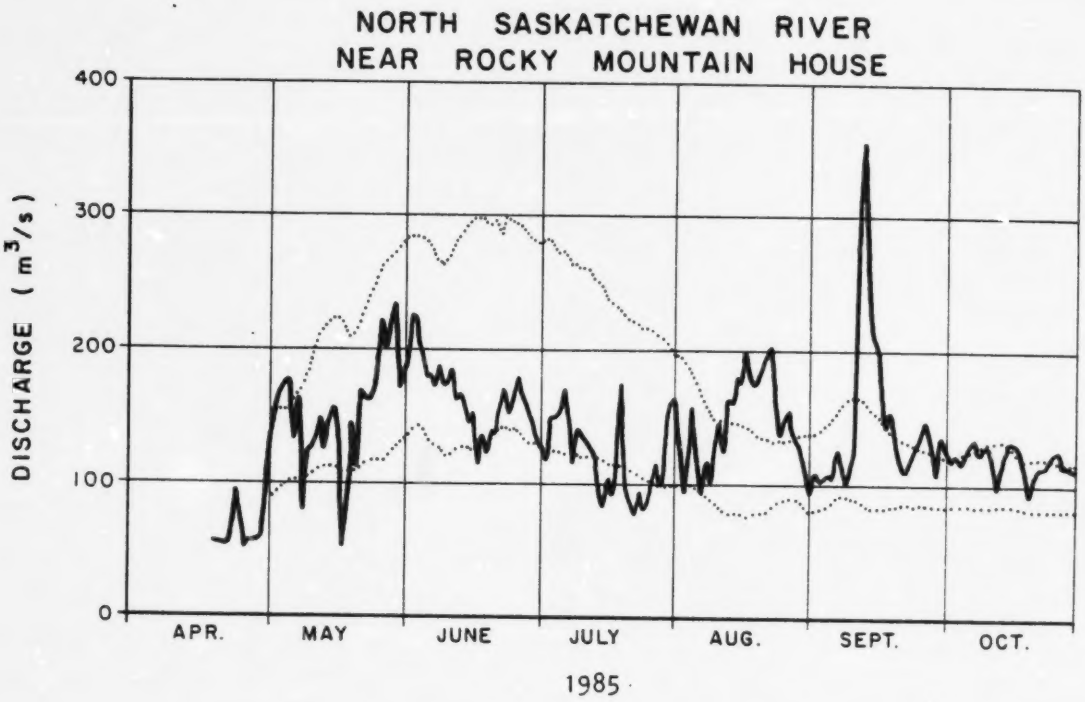
LEGEND

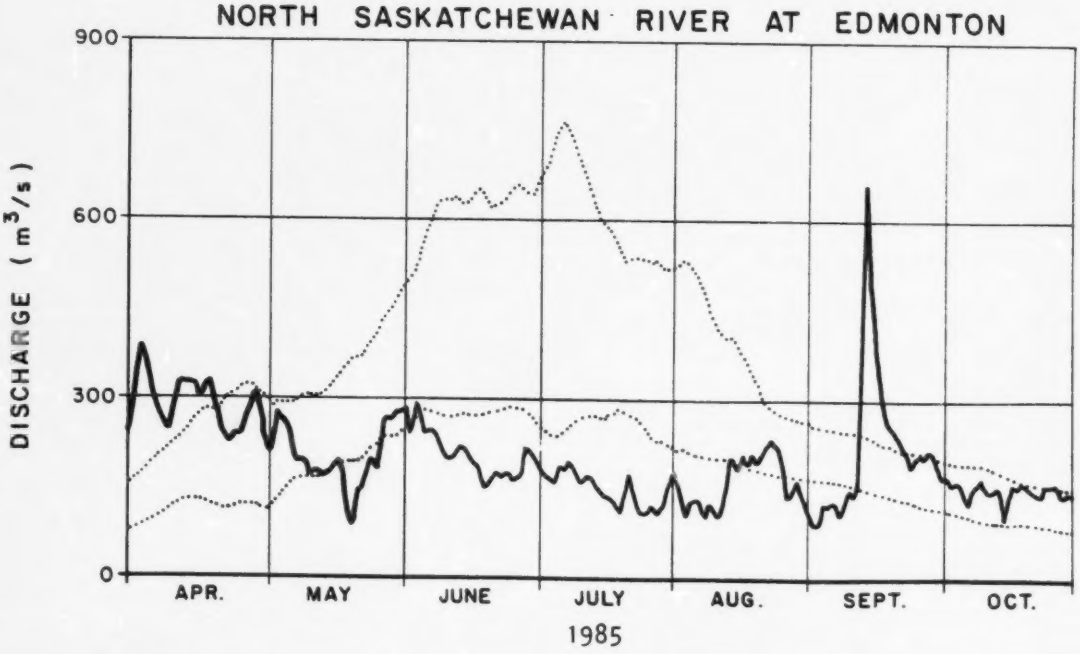
--- AVERAGE

—— 1985

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED	DESIGNED	SUMMER PRECIPITATION
DATE	CHECKED	NORTH SASKATCHEWAN
APPROVED	DRAWN B. Sanders	SCALE AS SHOWN
DATE	CHECKED	DATE DEC., 1984

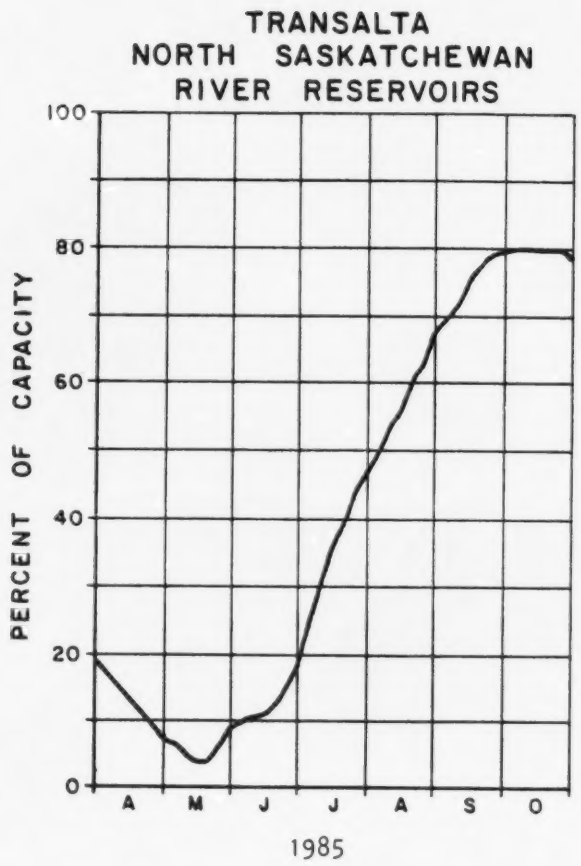
FIGURE 39 Page 54





NOTE: Solid line indicates flow for current year; dotted lines show upper and lower quartile values for period of record as an indication of the range of normal behaviour.

Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN
SUBMITTED DATE	DESIGNED CHECKED	STREAMFLOW HYDROGRAPHS NORTH SASKATCHEWAN RIVER BASIN
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN FIGURE 40 Page 55
		DATE JAN., 1985



Alberta ENVIRONMENT RIVER FORECAST CENTRE		WATER SUPPLY BULLETIN	
		RESERVOIR STORAGE NORTH SASKATCHEWAN RIVER BASIN	
SUBMITTED DATE	DESIGNED CHECKED		
APPROVED DATE	DRAWN B. Sanders CHECKED	SCALE AS SHOWN DATE DEC., 1984	FIGURE 41 Page 56

Alberta

APPENDIX A
SNOW SURVEY DATA

Alberta
ENVIRONMENT

Alberta
ENVIRONMENT

SNOW SURVEY ACTIVITIES

In 1984/85, Alberta Environment operated thirty seven snow courses in the mountainous areas of the Province and sixty seven in the plains. The following tables contain a summary of all the data collected at these sites in the winter of 1984/85 as well as information on the location of each course.

The main purpose of the snow network is to provide data to the River Forecast Centre to enable it to produce the Water Supply Outlook and make flood forecasts when necessary. For this reason the snow data are included in the Water Supply Outlook reports issued in early March, April, May and June of each year. In addition the data will be published along with snow data from other provinces by the Atmospheric Environment Service in their annual publication, "Snow Cover Data for Canada".

A historical summary containing all data collected in previous years at the snow courses included in this report is available upon request. This summary also includes data from discontinued snow courses. It should be noted that the snow courses are measured at approximately the same date every year. If the measurement cannot be carried out either six days before or six days after the first day of the month, it is not included in the summary.

In addition to the snow courses, data were collected from fourteen snow pillows in 1984/85. Ten of these pillows were equipped to give data on a real-time basis. The primary purpose of snow pillows is to provide an indication of the snow melt rate at higher elevations. On page A-15, a list of all snow pillows operated in 1984/85 is given. Graphs for the pillows which operated satisfactorily are presented on pages A-16 through A-26. The graphs indicate the accumulation and depletion of the water equivalent of the snow pack over the winter. Also shown for comparison purposes are the results of snow surveys carried out by conventional methods at adjacent snow courses.

In 1984/85 three snow courses located in the Cypress Hills which are measured at the end of January and mid-February were added to the list of Plains snow courses. Following are the details on these courses.

Name	Number	Approximate Location Latitude	Longitude	Elevation Metres	River Basin
Gros Ventre (Upper)	10Z05	49°38'	110°19'	1460	South Saskatchewan
Mitchell Creek (Upper)	10Z07	49°40'	110°18'	1450	South Saskatchewan
Ross Creek (Upper)	10Z09	49°40'	110°14'	1430	South Saskatchewan

Alberta
ENVIRONMENT

For further information on snow data, please contact.

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Water Survey Section Head
Technical Services Division
11th Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5k 2J6

Telephone: 427 - 6279

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
ST. MARY RIVER BASIN (U.S.A.)**								
Iceberg Lake Trail	04-25	197	765	422	1336	262	779	35
Peigan Pass	04-24	257	942	665	1671	419	1023	35
Mt. Allen	04-24	287	1069	831	1852	544	1181	35
Ptarmigan Lake	04-25	221	828	556	1618	414	986	35
Josephine Lower	04-24	120	401	196	833	112	432	30
OLDMAN RIVER BASIN								
Akamina Pass*	01-31	133	414	191	384	191	302	5
	02-26	183	539	254	472	254	396	6
	03-28	199	635	307	663	307	494	6
	04-30	126	511	371	691	320	446	5
	05-28	5	20	160	378	160	179	4
Allison Pass	01-31	104	312	193	310	193	254	4
	02-26	128	373	236	566	236	389	6
	03-27	142	415	307	823	302	495	22
	04-30	126	452	333	617	333	461	5
Gardiner Headwater*	01-31	152	584	371	371	371	371	2
	02-26	194	726	465	465	465	465	2
	03-28	218	782	498	498	498	498	2
	04-30	180	805	605	605	605	605	2
	05-28	55	302	559	559	559	559	2
Lee Creek "D"	02-27	79	196	56	444	56	178	12
	03-26	79	222	46	615	46	214	16
Lee Creek "E"	02-27	94	239	156	267	91	175	8
	03-26	96	279	147	536	147	259	9
Lee Creek "F"	02-27	65	170	76	231	76	147	10
	03-26	52	163	53	356	53	179	11
Lee Creek "P"	02-27	57	137	48	366	48	158	12
	03-26	59	161	41	358	41	168	13

* Snow pillow data also available at these sites

** Data collected in cooperation with the U.S. Soil Conservation Service

Alberta
ENVIRONMENT

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Lee Creek "Q"	02-27	80	201	N/A	320	97	167	14
	03-26	72	198	104	315	91	176	14
Middle Drywood	03-26	15	41	36	97	0	47	20
Racehorse Creek*	01-31	98	315	188	338	188	263	3
	02-26	123	389	254	447	254	351	3
	03-28	153	482	320	320	320	320	2
	04-30	133	490	330	508	330	419	3
	05-28	14	66	216	216	94	155	3
Westcastle Bush	01-31	107	320	160	343	160	246	4
	02-26	140	399	198	429	198	324	5
	03-28	140	460	218	282	218	460	5
	04-30	63	264	168	533	168	345	4
Wilkinson Bush	03-28	101	239	137	460	112	218	22
Wilkinson Open	03-28	76	158	99	417	94	184	21
BOW RIVER BASIN								
Bow River	01-31	67	139	122	262	79	168	19
	02-28	73	163	142	386	112	204	19
	03-28	72	175	142	437	97	211	49
Bow Summit (NEW)	01-30	90	236	244	292	178	244	6
	02-27	109	290	286	368	277	325	7
	03-27	113	315	330	434	330	367	7
	05-01	117	378	312	439	305	352	7
	05-29	16	64	234	262	0	164	5
Chateau Lawn	01-31	73	175	140	284	122	214	17
	02-28	84	203	170	401	155	260	17
	03-28	81	211	196	480	135	274	44
Cuthead Lake	02-27	102	267	312	312	249	280	4
	03-27	112	310	330	490	302	389	7
	05-01	106	338	333	485	318	386	7
	05-29	23	89	318	404	56	282	7

* Snow pillow data also available at these sites

Alberta
ENVIRONMENT

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Highwood Bush	01-29	100	262	231	439	132	275	11
	02-26	113	307	254	439	241	337	13
	03-26	122	325	330	681	259	391	16
	04-30	141	460	358	726	221	419	22
	05-28	58	224	401	455	216	361	5
Katherine Lake	02-27	104	274	381	381	381	381	2
	03-27	116	330	389	521	371	414	5
	05-01	139	419	N/A	541	284	500	4
	05-29	70	297	498	554	363	450	5
Larch Valley	02-27	108	259	345	399	345	371	4
	03-27	111	302	378	475	378	432	6
	05-01	129	381	417	546	417	472	7
	05-29	61	226	444	483	271	389	6
Little Elbow Summit*	01-29	90	221	147	249	122	177	7
	02-26	106	279	188	262	188	234	7
	03-26	115	307	234	348	234	287	7
	04-30	137	406	287	394	259	336	7
	05-28	43	147	292	373	208	292	5
Lost Creek	01-31	103	320	193	193	193	193	2
	02-26	124	386	272	272	272	272	2
	03-28	159	454	328	328	328	328	2
	04-30	185	635	417	417	417	417	2
	05-28	85	351	457	457	457	457	2
Mirror Lake	01-31	71	187	203	348	109	216	19
	02-27	82	183	239	483	142	258	19
	03-27	80	211	239	561	160	299	46
Mud Lake	01-29	86	211	160	236	160	203	4
	02-26	110	292	163	295	163	237	4
	03-26	110	305	257	424	269	319	8
	04-30	104	366	241	551	206	357	13
	05-28	0	0	122	272	0	131	4
Pipestone, Upper	01-31	74	157	137	279	89	165	19
	02-28	82	201	157	376	107	213	19
	03-28	77	196	152	434	109	211	49

* Snow pillow data also available at these sites

Alberta
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ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Ptarmigan Hut	02-27	111	282	323	564	213	342	17
	03-27	118	338	376	681	254	414	19
	05-01	118	373	345	658	196	372	19
	05-29	21	74	338	338	0	226	5
Sunshine Village*	01-31	112	322	343	447	317	371	8
	02-28	151	399	406	770	277	491	16
	03-28	150	478	467	996	406	629	19
	05-01	166	551	508	1092	338	648	19
	05-29	81	330	592	627	203	431	7
Tent Ridge	01-29	89	226	163	259	163	214	5
	02-28	N/A	N/A	178	300	178	257	4
	03-26	118	333	251	389	251	324	51
	04-30	118	384	254	498	254	361	5
	05-28	17	53	231	376	0	202	4
Three Isle Lake*	01-29	117	363	376	376	358	368	4
	02-28	141	439	455	531	445	477	4
	03-26	154	513	544	653	503	565	5
	04-30	169	597	579	737	572	627	4
	05-28	88	352	640	673	345	561	5
Mist	03-26	74	188	150	302	140	199	9
	04-30	31	104	38	523	0	178	20
RED DEER RIVER BASIN								
Gable Mountain	02-27	58	119	135	135	127	131	4
	03-27	62	130	157	216	132	168	4
	05-01	54	163	137	229	137	187	5
	05-29	0	0	81	130	0	77	5
Limestone Mountain*	01-29	45	86	83	83	62	73	3
	03-05	60	114	80	80	80	80	2
	03-28	67	137	127	127	91	109	3
	05-01	62	176	94	127	94	111	3
	05-27	0	0	19	19	19	19	2
McConnel Creek	02-27	65	150	109	185	109	141	5
	03-27	66	132	122	216	122	168	5
	05-01	52	178	89	198	76	135	5
	05-29	0	0	0	109	0	40	5

*Snow pillow data also available at these sites

ALBERTA SNOW COURSE DATA
MOUNTAIN AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Skoki Mountain*	02-27	99	231	284	287	280	284	4
	03-27	102	264	310	396	302	343	7
	05-01	113	333	345	414	325	358	7
	05-29	27	104	335	358	0	214	7
NORTH SASKATCHEWAN RIVER BASIN								
Nigel Creek	01-30	84	216	261	528	173	278	15
	02-26	115	284	292	655	185	359	14
	03-26	114	333	353	686	198	420	17
	04-30	120	371	333	752	208	425	16
ATHABASCA RIVER BASIN								
Marmot-Jasper	02-27	81	187	150	208	115	170	6
	03-27	78	197	176	422	152	247	16
	05-01	78	241	175	401	0	227	16
Sunwapta Falls	01-30	62	124	99	183	84	131	15
	02-27	69	154	107	277	79	165	14
	03-27	65	163	126	333	89	198	17
	05-01	45	130	89	340	0	158	16

*Snow pillow data also available at these sites

Alberta
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ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
CYPRESS HILLS								
Gross Ventre (Upper)	01-23	38	81	74	74	53	61	4
	02-19	46	104	84	102	46	71	5
Mitchell Creek (Upper)	01-23	45	94	79	79	69	74	4
	02-19	52	114	89	89	81	85	3
Ross Creek (Upper)	01-23	N/A	90E	81	84	66	77	4
	02-19	49	95	122	122	81	102	3
RED DEER RIVER BASIN								
Bentley	02-27	29	62	40	79	7	44	12
	03-14	25	61	34	79	0	41	9
	03-27	18	49	0	150	0	46	11
Dickson	02-27	18	50	34	97	34	58	12
	03-13	16	45	37	124	0	56	9
	03-27	10	22	0	112	0	51	11
Hoadley	02-27	23	67	41	74	6	44	11
	03-14	18	64	59	102	0	51	11
	03-29	10	30	30	163	0	51	11
Innisfail, East	02-26	22	48	27	53	0	26	10
	03-13	20	51	27	89	0	28	9
	03-27	5	14	0	122	0	25	10
James River	02-27	45	93	57	107	31	60	11
	03-13	46	102	81	122	41	74	10
	03-28	44	99	77	122	43	77	11
Kneehill Valley	02-26	20	47	33	99	15	52	11
	03-13	18	53	34	112	0	54	11
	03-27	11	29	9	86	0	36	10
Sundre	02-27	19	41	35	84	6	44	11
	03-13	17	47	53	107	0	49	10
	03-28	0	0	15	119	0	43	11

Alberta
ENVIRONMENT

ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
NORTH SASKATCHEWAN RIVER BASIN								
Bellis	02-26	50	107	59	122	39	70	12
	03-12	48	100	77	112	56	79	11
	03-26	34	100	46	152	29	81	9
Brazeau Reservoir	02-25	43	93	79	94	51	72	9
	03-13	34	89	91	127	41	77	9
	03-25	22	69	58	126	0	58	9
Brown Creek	02-25	43	78	86	132	36	64	9
	03-13	33	70	97	137	31	68	8
	03-26	24	59	88	147	18	70	9
Bruce Snow Pillow*	02-05	28	52	51	58	25	42	6
	02-28	31	66	57	74	30	54	10
	03-14	29	65	66	97	43	68	11
	03-26	20	64	48	94	10	66	10
Clandonald	02-27	37	81	70	122	13	57	12
	03-13	32	79	63	81	20	55	11
	03-27	8	22	21	168	0	56	11
Coronation	02-26	27	79	47	99	13	41	12
	03-12	24	68	61	102	0	32	10
	03-26	17	53	41	165	0	32	11
Crimson Lake	02-27	33	66	68	99	8	64	12
	03-13	28	68	89	114	0	72	10
	03-25	17	52	77	122	0	70	11
Elk Island Park	02-27	43	119	54	152	28	71	12
	03-13	42	114	63	114	27	70	11
	03-29	28	84	44	180	0	79	9
Gadsby	02-26	16	43	42	99	0	39	13
	03-14	14	35	37	64	0	24	12
	03-26	0	0	0	135	0	19	13
Leduc	02-28	21	59	51	130	41	75	12
	03-14	14	57	34	130	34	68	11
	03-29	3	9	0	168	0	61	11

* Snow pillow data also available for this site.

Alberta
ENVIRONMENT

ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Lougheed	02-26	30	69	53	74	30	51	11
	03-12	28	75	53	79	0	47	11
	03-26	18	52	4	119	0	48	10
Mannville	02-28	23	60	61	104	30	55	11
	03-14	21	60	73	81	0	48	11
	03-27	2	6	17	109	0	42	10
Morinville	02-26	27	85	44	130	17	53	12
	03-12	21	65	25	94	20	50	11
	03-28	3	13	0	170	0	51	10
Nordegg	02-27	38	84	71	90	6	50	11
	03-13	39	86	91	91	15	65	10
	03-27	35	83	86	109	0	70	11
Onoway	02-27	38	115	37	109	15	55	12
	03-14	36	112	44	112	8	48	11
	03-29	20	63	0	196	0	42	10
Pipestone Creek	02-05	27	46	71	79	30	57	6
	02-28	18	48	51	102	18	59	10
	03-14	14	46	53	137	0	53	10
	03-29	5	14	6	124	0	39	8
Saint Paul	02-27	25	70	48	99	13	48	12
	03-13	22	72	62	99	14	47	11
	03-27	8	27	3	117	0	45	11
Two Hills	02-27	25	78	63	124	28	58	12
	03-13	26	74	61	76	29	51	11
	03-26	11	36	0	152	0	36	10
Wainwright	02-28	22	65	49	51	28	40	10
	03-14	22	61	54	56	0	38	11
	03-27	9	26	17	150	0	35	11
Waskatenau	02-26	32	77	40	117	30	59	12
	03-12	30	86	23	86	23	58	11
	03-28	19	64	0	147	0	62	10
Wetaskiwin	02-28	19	52	34	69	0	39	12
	03-14	15	52	32	97	0	39	10
	03-28	8	25	0	99	0	24	10

Alberta
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ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
CHURCHILL RIVER BASIN								
Bonnyville, North	02-26	43	66	53	119	35	59	11
	03-13	40	82	62	102	25	58	11
	03-27	22	55	22	155	0	62	11
ATHABASCA RIVER BASIN								
Barrhead, North	02-27	31	86	31	145	18	61	12
	03-14	25	80	34	109	33	57	11
	03-29	6	19	0	147	0	54	11
Barrhead, West	02-27	38	103	33	99	13	55	12
	03-14	28	89	46	84	28	51	11
	03-29	9	31	0	145	0	48	11
Edson	02-28	53	135	65	155	36	77	11
	03-14	50	127	86	165	25	80	12
	03-28	42	115	36	168	0	63	11
Embarras Portage	02-04	40	46	48	76	48	58	7
	02-26	45	69	65	102	41	69	11
	03-12	36	64	62	112	48	77	12
	03-28	33	76	43	99	38	62	9
Flatbush	02-26	60	131	51	99	28	68	12
	03-13	57	127	54	112	43	70	11
	03-28	34	104	0	175	0	67	10
Fort Chipewyan Airport*	01-28	40	56	38	86	28	50	12
	02-25	47	71	44	122	28	65	11
	03-11	42	74	55	152	28	77	13
	03-25	49	74	55	127	41	84	12
Grassland	02-26	33	88	33	102	8	49	12
	03-12	28	79	36	107	10	47	11
	03-28	12	39	0	130	0	52	11
High Prairie	02-27	33	94	0	132	0	65	12
	03-14	20	55	0	112	0	61	11
	03-28	14	46	0	185	0	73	10

* Snow pillow data also available for this site.

Alberta
ENVIRONMENT

ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Highrock Tower	01-28	42	61	43	114	25	53	11
	02-25	51	69	64	122	30	69	11
	03-11	46	75	64	130	33	76	11
	03-29	54	107	61	142	38	81	10
Hinton	02-28	37	81	104	122	41	74	11
	03-14	33	81	121	152	23	90	12
	03-28	31	74	109	157	0	82	11
Jackfish Village	02-04	36	43	38	76	38	51	9
	02-28	39	53	60	94	43	69	9
	03-14	35	69	65	102	33	73	11
	03-27	38	66	60	104	23	77	11
Kinuso	02-26	70	155	58	107	23	73	12
	03-13	58	161	64	130	38	74	11
	03-28	46	137	0	163	0	67	10
Lodgepole	02-28	53	137	82	137	42	82	12
	03-14	49	134	92	157	28	80	20
	03-25	40	123	49	165	0	77	13
Mayerthorpe*	02-06	50	80	43	114	23	60	4
	02-27	48	108	54	114	36	68	4
	03-14	41	100	71	152	51	91	4
	03-29	36	95	18	150	18	76	4
Meadowview	02-27	43	113	46	137	30	74	12
	03-14	39	109	58	132	41	71	21
	03-29	21	64	15	160	0	71	12
Obed	02-28	36	92	76	165	0	72	11
	03-14	32	85	91	178	0	86	12
	03-28	20	58	50	196	0	77	11
Perryvale, East	02-26	45	116	50	137	32	64	12
	03-12	39	118	51	94	37	64	11
	03-28	32	105	12	150	0	61	10
Saulteaux River	02-26	46	96	53	112	38	71	12
	03-13	35	94	52	109	48	71	11
	03-28	32	97	5	198	5	72	10

* Snow pillow data also available for this site.

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ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm) 1985	1984	Prior to 1985 Max.	Min.	Ave.	Total Years of Record
Twin Lakes*	02-06	41	81	33	84	18	45	4
	02-27	38	94	48	94	28	57	4
	03-14	32	83	54	109	31	65	4
	03-29	22	67	11	119	11	58	4
Westlock	02-26	26	91	44	130	13	56	14
	03-13	21	66	28	112	0	55	21
	03-28	10	27	0	160	0	44	11
Whitecourt	02-27	43	106	45	157	28	80	12
	03-14	38	108	52	127	32	80	11
	03-29	42	112	0	157	0	67	10
PEACE RIVER BASIN								
Bezanson	02-28	0	0	0	145	0	68	11
	03-14	0	0	10	144	10	73	12
	03-28	0	0	0	193	0	64	10
Eureka River	02-28	45	70	60	127	51	76	12
	03-15	42	88	66	122	48	83	11
	03-29	39	89	48	155	0	71	9
Fairview	02-28	34	69	34	130	22	70	12
	03-15	31	61	41	117	16	80	12
	03-29	25	71	0	112	0	60	9
Girouxville	02-27	19	77	22	130	22	63	12
	03-14	10	34	17	127	0	57	11
	03-28	N/A	23	0	124	0	49	10
Hythe	02-28	N/A	N/A	0	142	0	64	12
	03-14	0	0	10	151	0	59	11
	03-28	0	0	0	173	0	56	10
Little Smoky River	02-27	54	110	48	141	47	84	10
	03-14	38	98	48	146	0	83	12
	03-28	29	83	0	164	0	72	9
North Star-Manning	02-28	5	20	0	86	0	40	11
	03-15	N/A	N/A	0	99	0	41	11
	03-29	N/A	N/A	0	107	0	45	9

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ALBERTA SNOW COURSE DATA
PLAINS AREA

STATION NAME	Date of Survey (Mo-Day)	Snow Depth (cm) 1985	Water Equivalent (mm)					Total Years of Record
			1985	1984	Prior to 1985 Max.	Prior to 1985 Min.	Ave.	
Rycroft	02-28	10	37	0	127	0	53	12
	03-15	N/A	27	8	126	0	46	11
	03-29	0	0	0	155	0	56	9
Sexsmith	03-01	44	85	33	190	33	88	12
	03-14	38	107	27	160	27	88	11
	03-28	21	61	0	218	0	95	9
Spring Creek #1*	01-28	46	94	52	137	27	84	19
	02-25	64	123	60	180	56	113	19
	03-15	47	128	64	213	34	118	18
	03-25	36	95	0	216	0	104	18
Spring Creek #2*	01-28	42	91	48	130	24	77	19
	02-25	58	114	53	166	50	104	19
	03-15	33	103	41	198	27	103	18
	03-25	16	51	0	208	0	89	18
Spring Creek #3	01-28	44	86	41	145	41	84	19
	02-25	61	132	69	180	48	109	18
	03-15	40	118	62	206	33	115	18
	03-25	26	80	0	216	0	103	18
Spring Creek #4	01-28	42	84	60	140	42	85	18
	02-25	54	122	67	189	51	112	18
	03-15	47	123	67	191	43	114	17
	03-25	34	97	47	224	13	109	17
Sweetgrass	01-29	42	46	41	46	25	38	7
	02-27	47	69	60	140	36	65	9
	03-13	45	86	0	137	0	57	8
	03-26	47	79	69	137	28	66	9

* Snow pillow data also available for this site.

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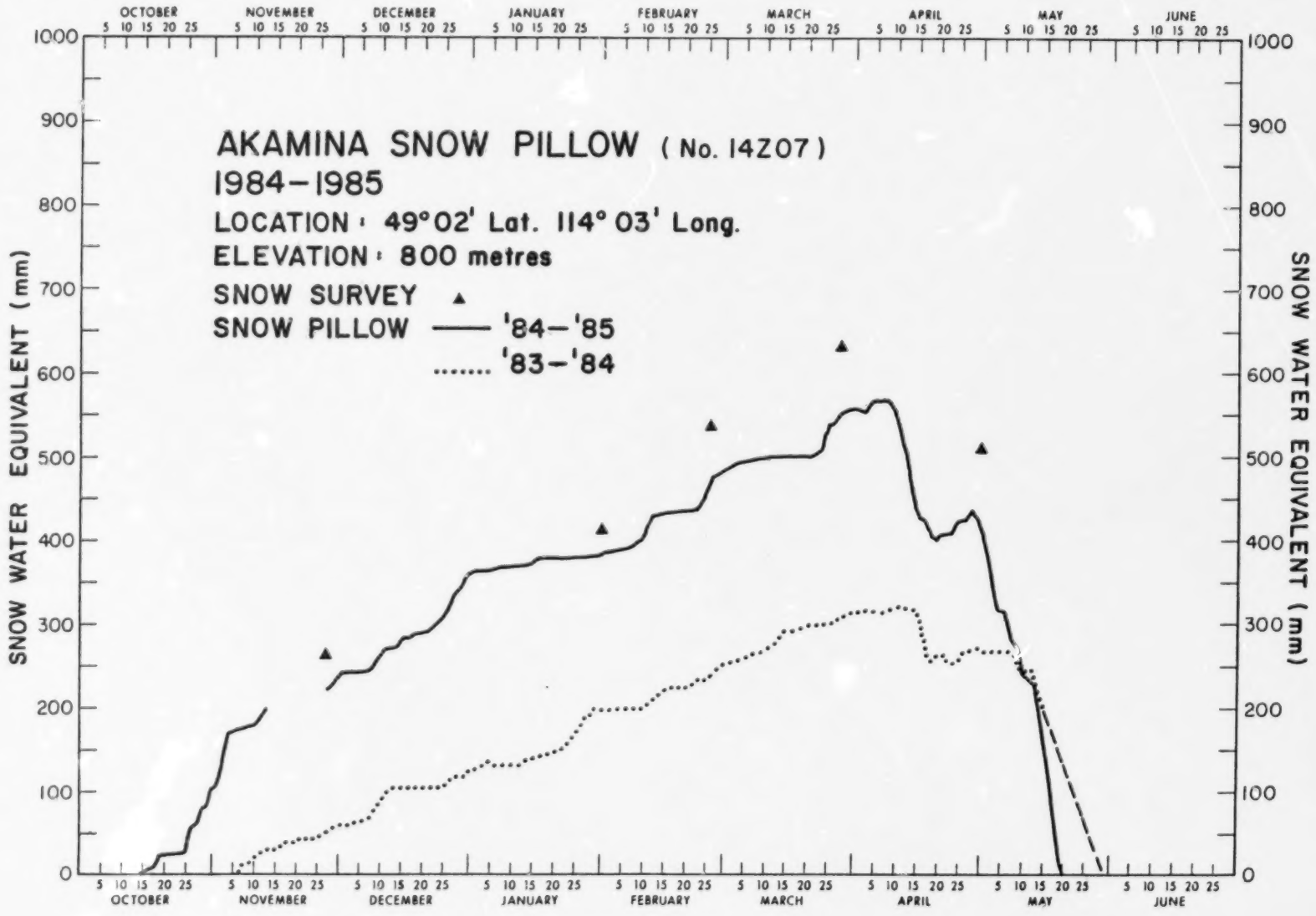
LIST OF SNOW PILLOWS

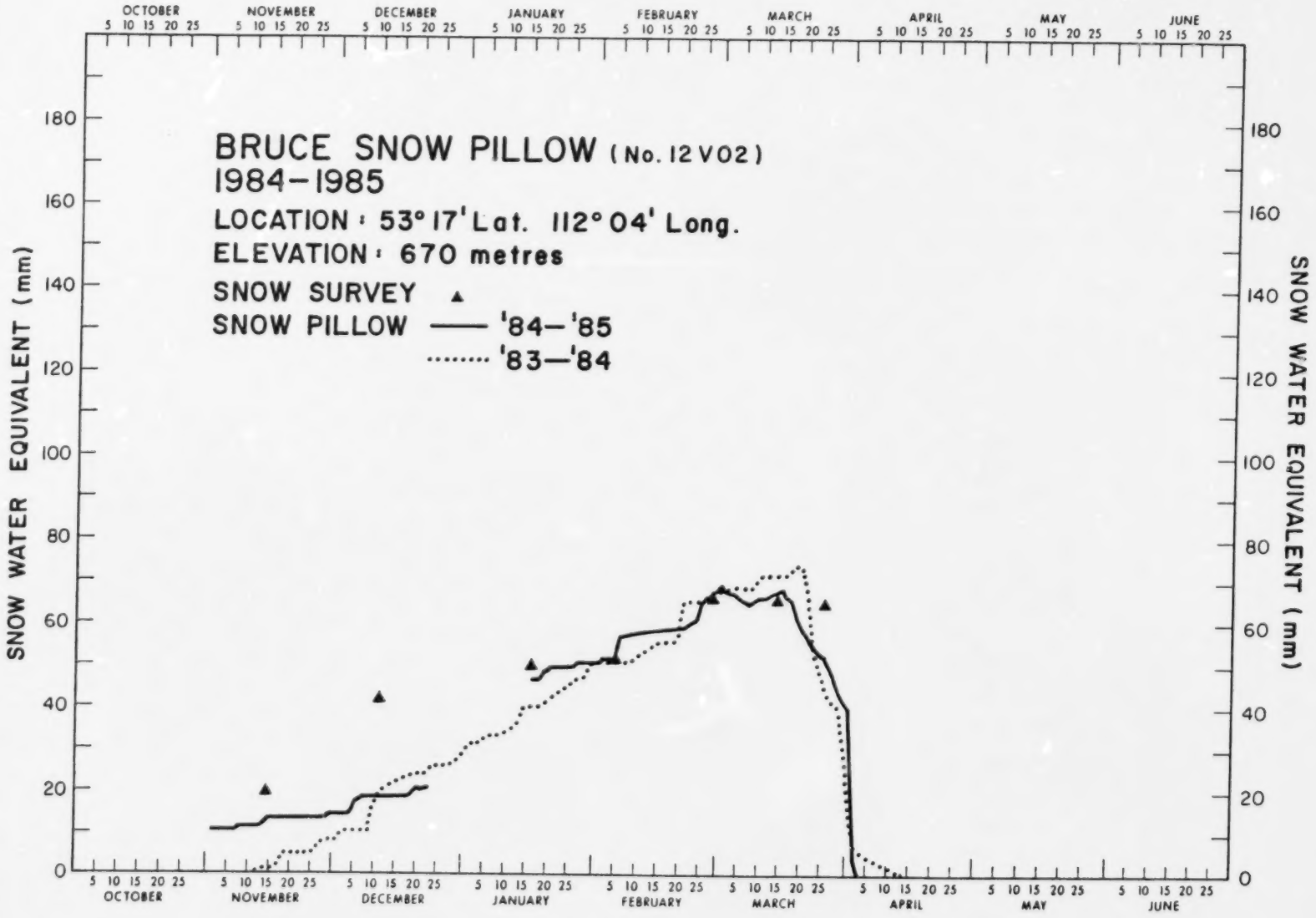
1984 / 1985

NAME	SNOW COURSE NUMBER	RIVER BASIN	ELEVATION (METRES)
Akamina	14Z07	Oldman	1800
Bruce	12V02	N. Saskatchewan	670
Fort Chipewyan Airport	11Q02	Athabasca	210
Gardiner Headwaters*	14Z10	Oldman	1970
Little Elbow Summit	14Y18	Bow	2160
Limestone Ridge	15X06	N. Saskatchewan	1950
Mayerthorpe	15V07	Athabasca	760
Mount Skoki	16X15	Bow	2055
Racehorse Creek	14Z08	Oldman	1920
Spring Creek #1	17V02	Peace	720
Spring Creek #2	17V03	Peace	655
Sunshine Village	15X03	Bow	2225
Three Isle Lake	15Y25	Bow	2160
Twin Lakes	14V10	Athabasca	655

* Because of a malfunction at the Gardiner snow pillow, no plot is available.


AKAMINA SNOW PILLOW (No. 14Z07)
1984–1985
LOCATION : 49°02' Lat. 114° 03' Long.
ELEVATION : 800 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
0
100
200
300
400
500
600
700
800
900
1000
5 10 15 20 25

Alberta


BRUCE SNOW PILLOW (No. 12V02)
1984–1985
LOCATION : 53° 17' Lat. 112° 04' Long.
ELEVATION : 670 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
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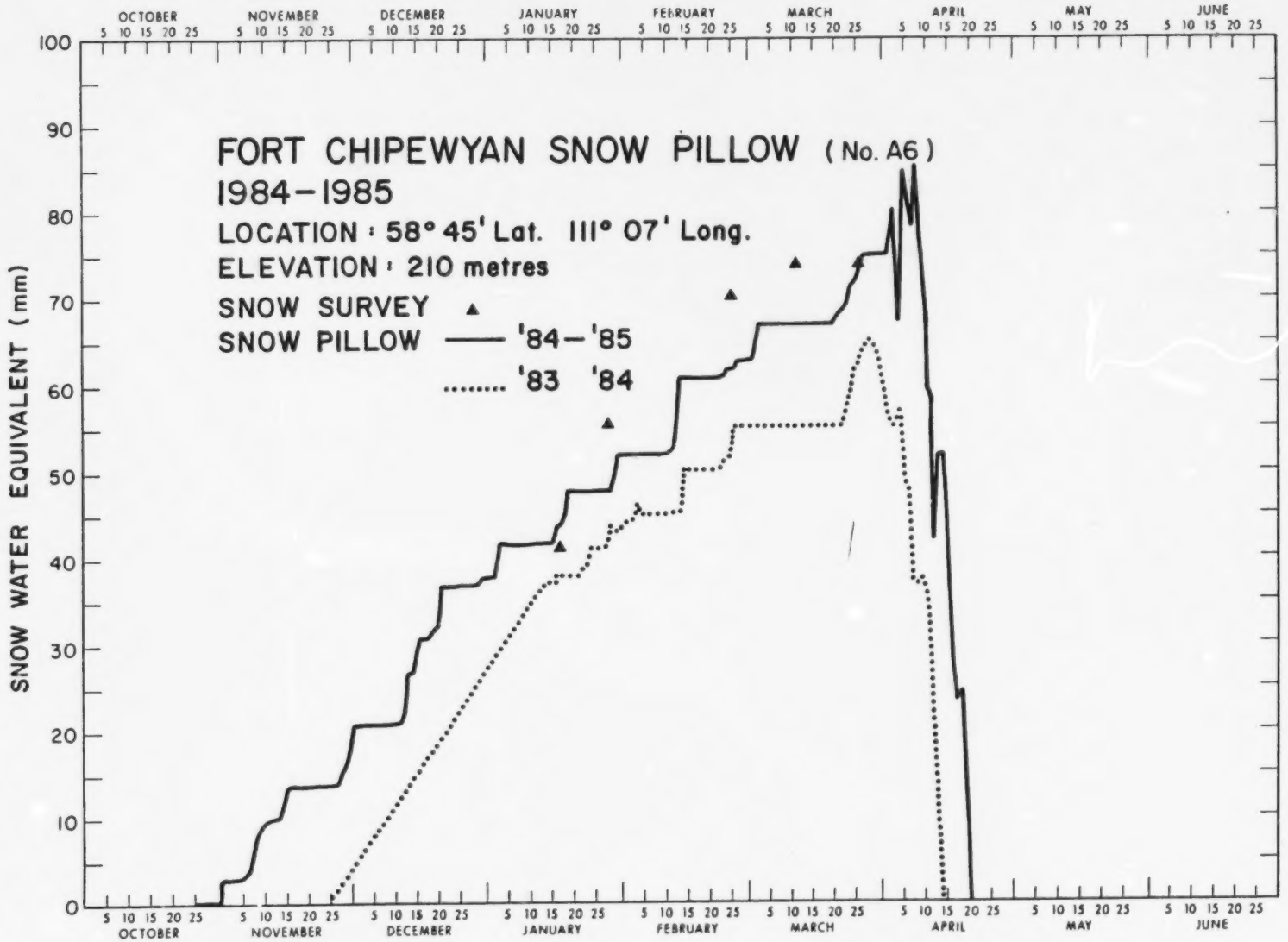
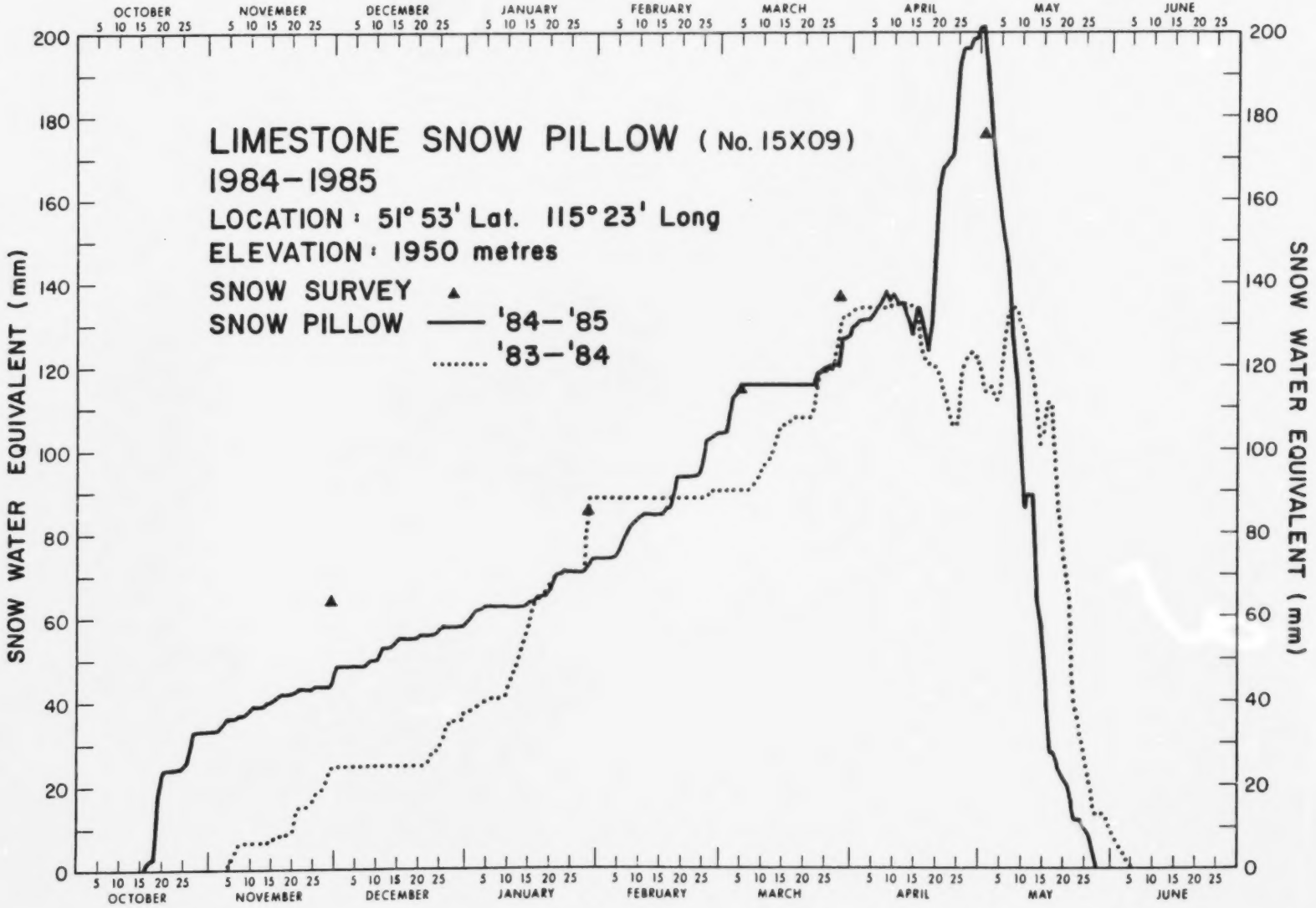
160
180



SNOW WATER EQUIVALENT (mm)

Alberta ENVIRONMENT


LIMESTONE SNOW PILLOW (No. 15X09)
1984–1985
LOCATION : 51° 53' Lat. 115° 23' Long
ELEVATION : 1950 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
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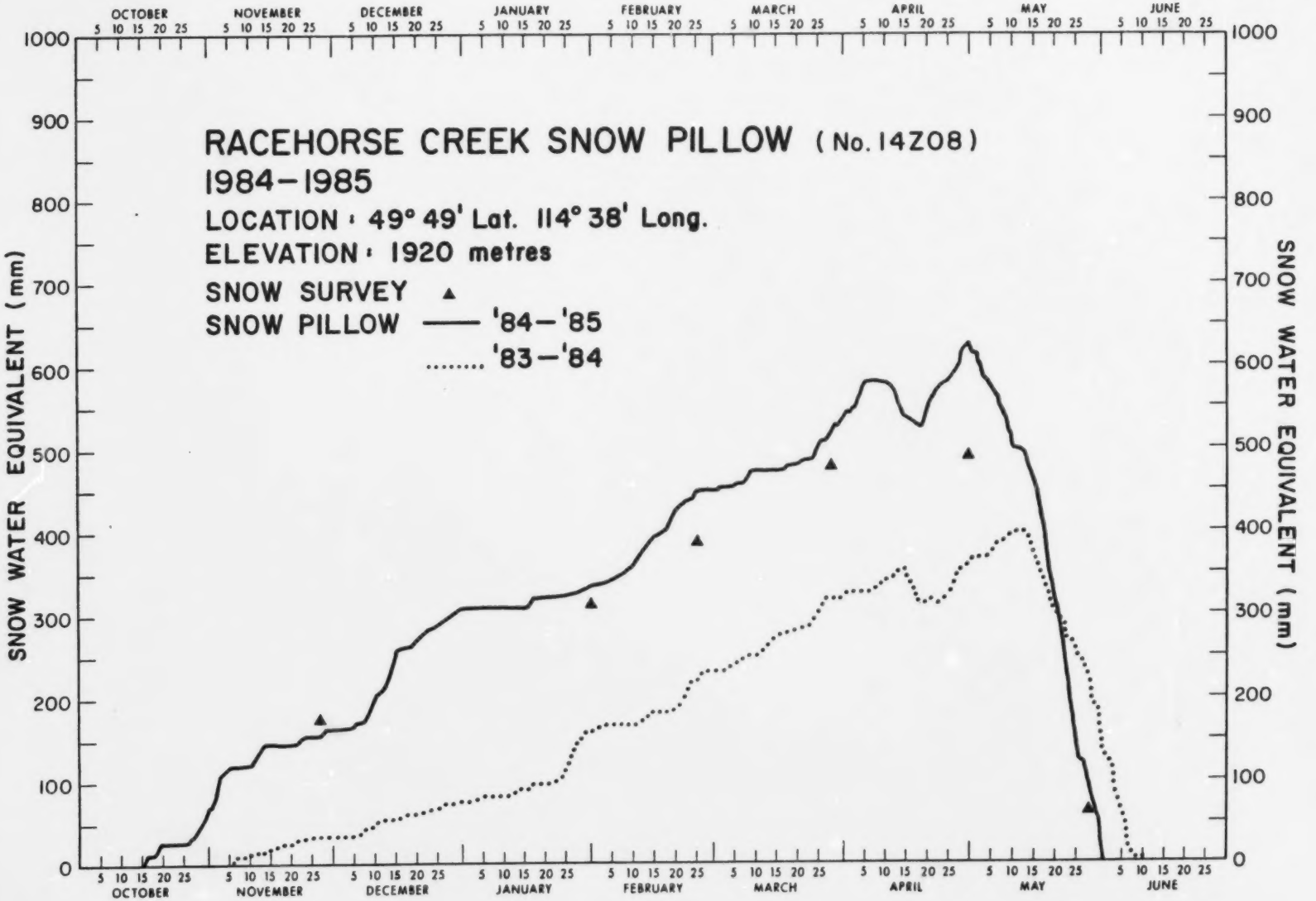
RACEHORSE CREEK SNOW PILLOW (No. 14Z08)
1984–1985
LOCATION : 49° 49' Lat. 114° 38' Long.
ELEVATION : 1920 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
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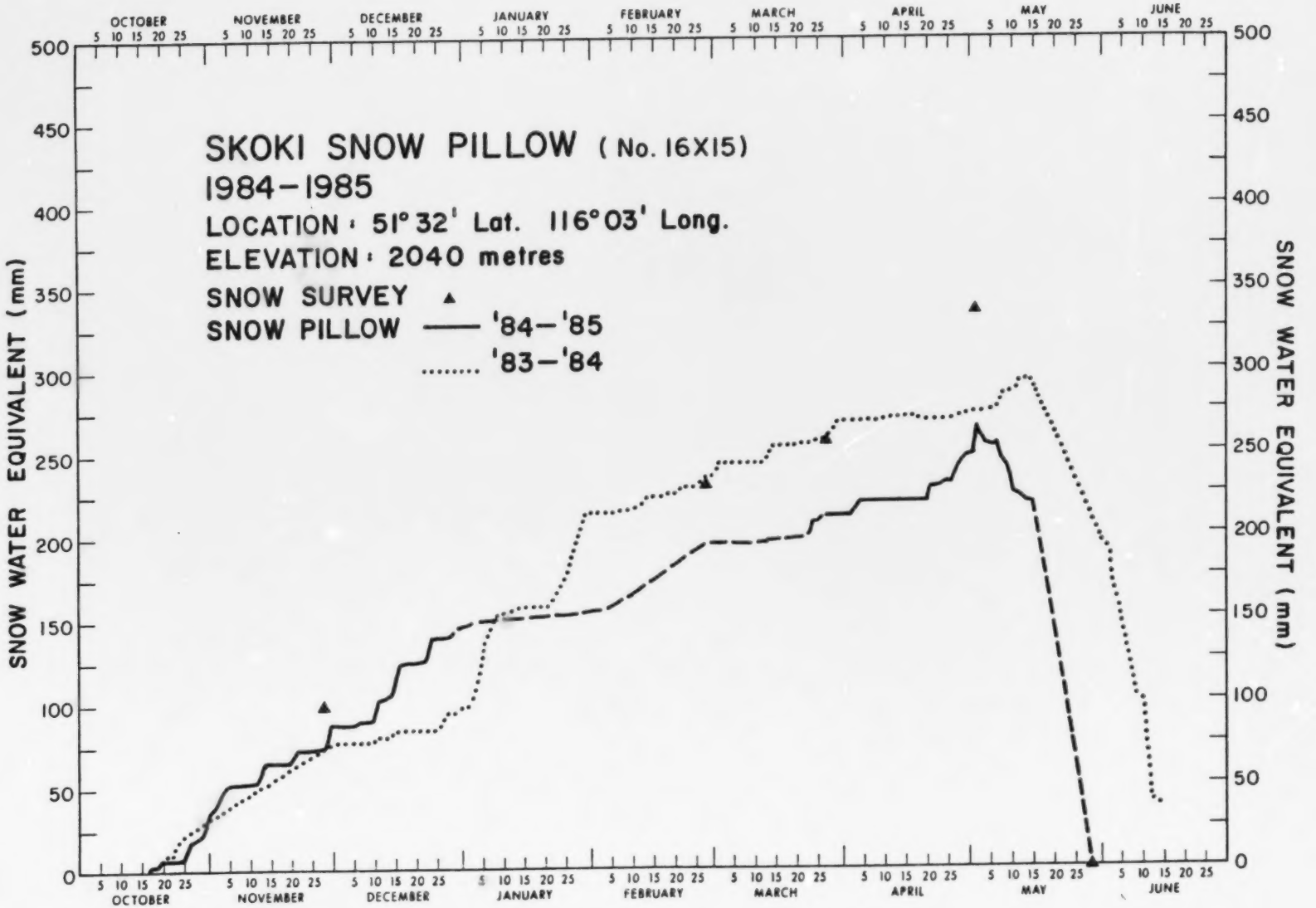
SKOKI SNOW PILLOW (No. 16X15)
1984–1985
LOCATION : 51° 32' Lat. 116° 03' Long.
ELEVATION : 2040 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
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JUNE
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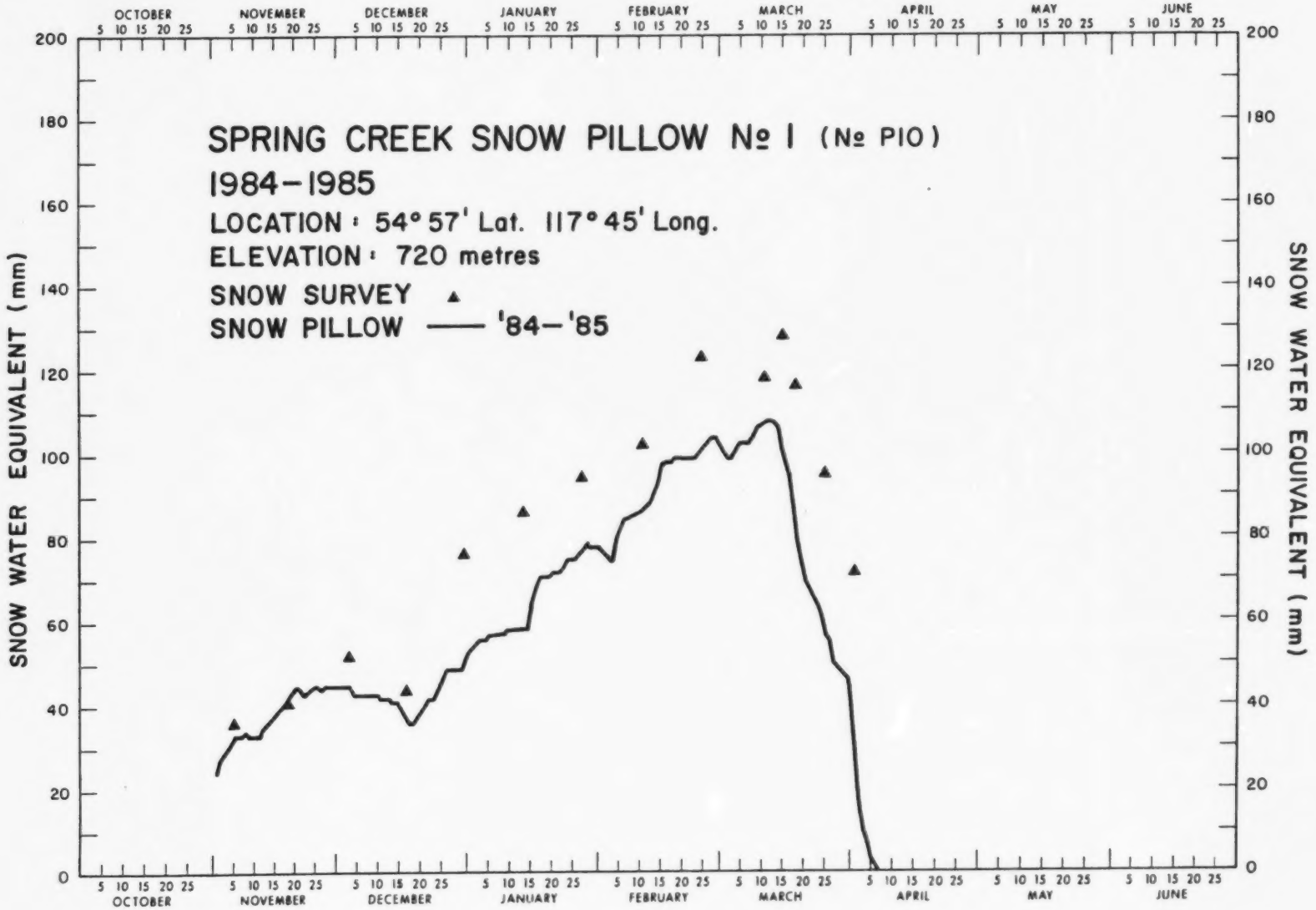
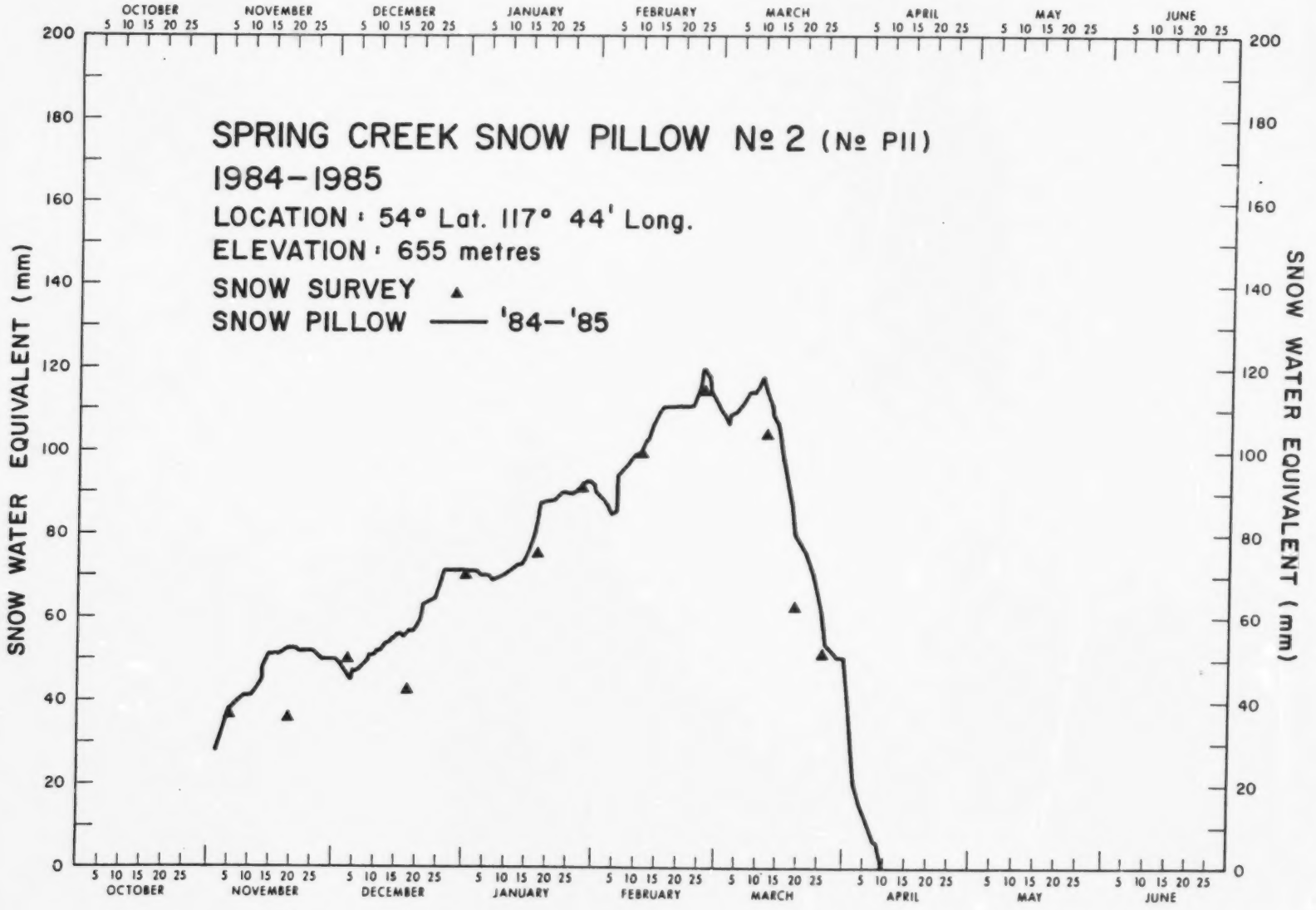


Alberta ENVIRONMENT


SPRING CREEK SNOW PILLOW № 2 (№ P11)
1984–1985
LOCATION : 54° Lat. 117° 44' Long.
ELEVATION : 655 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
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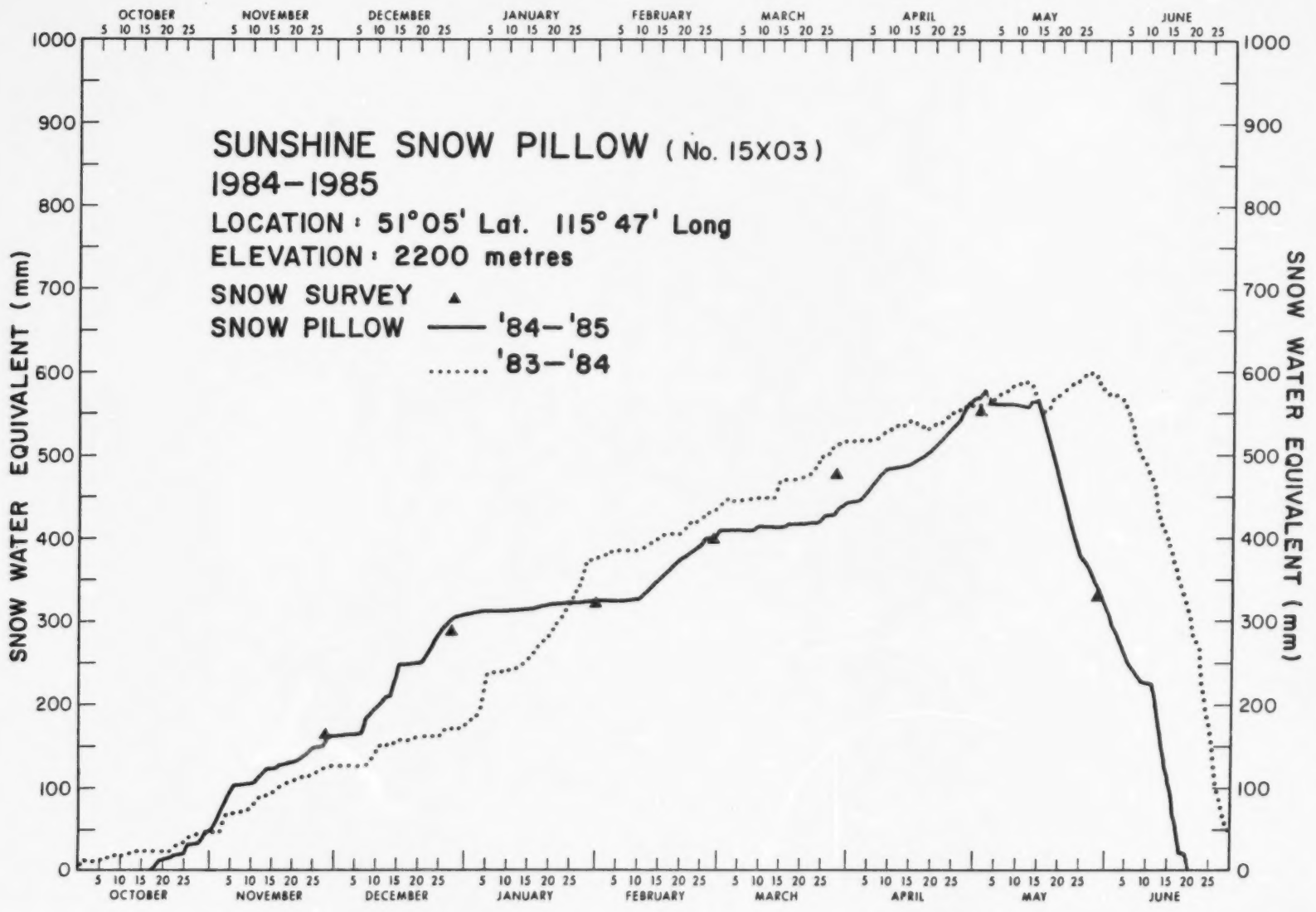
SUNSHINE SNOW PILLOW (No. 15X03)
1984–1985
LOCATION : 51°05' Lat. 115°47' Long
ELEVATION : 2200 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
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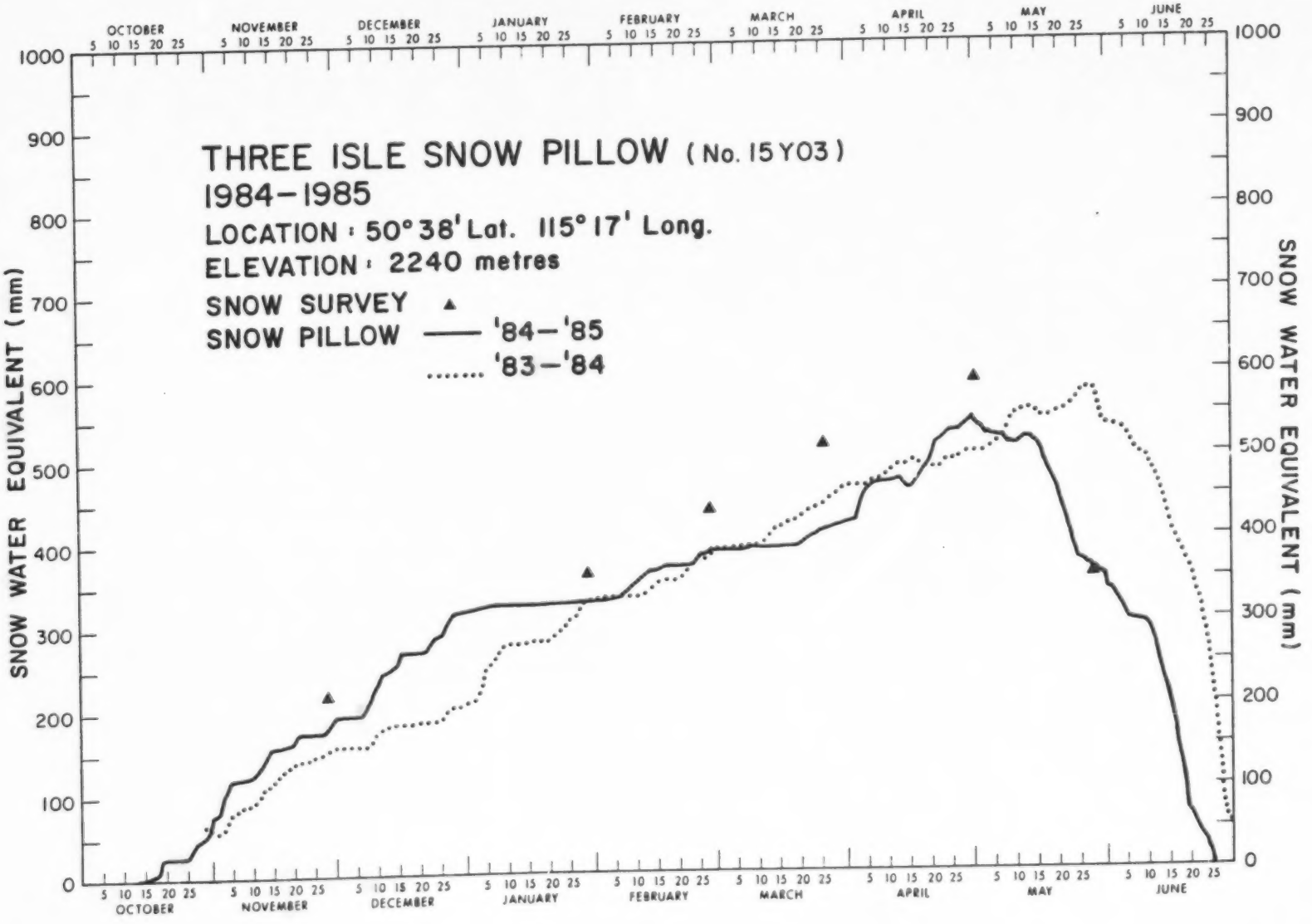
5 10 15 20 25

Alberta


THREE ISLE SNOW PILLOW (No. 15Y03)
1984–1985
LOCATION : 50° 38' Lat. 115° 17' Long.
ELEVATION : 2240 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
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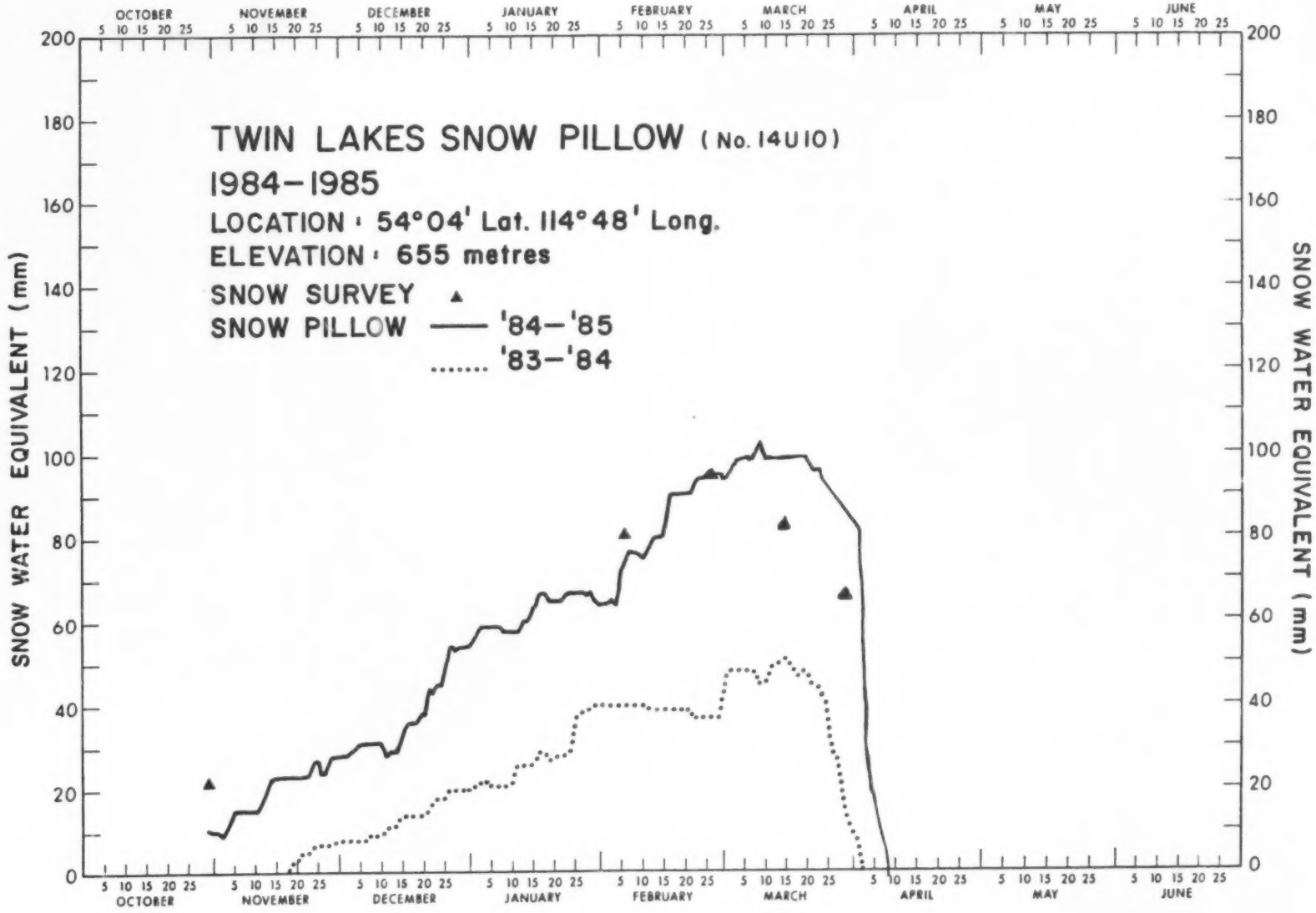
TWIN LAKES SNOW PILLOW (No. 14U10)
1984–1985
LOCATION : 54°04' Lat. 114°48' Long.
ELEVATION : 655 metres
SNOW SURVEY ▲
SNOW PILLOW —— '84–'85
..... '83–'84
SNOW WATER EQUIVALENT (mm)
SNOW WATER EQUIVALENT (mm)
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
JUNE
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80
100
120
140
160
180
200

Alberta

SACRAMENTO STORAGE GAUGE DATA
WINTER PRECIPITATION TOTAL

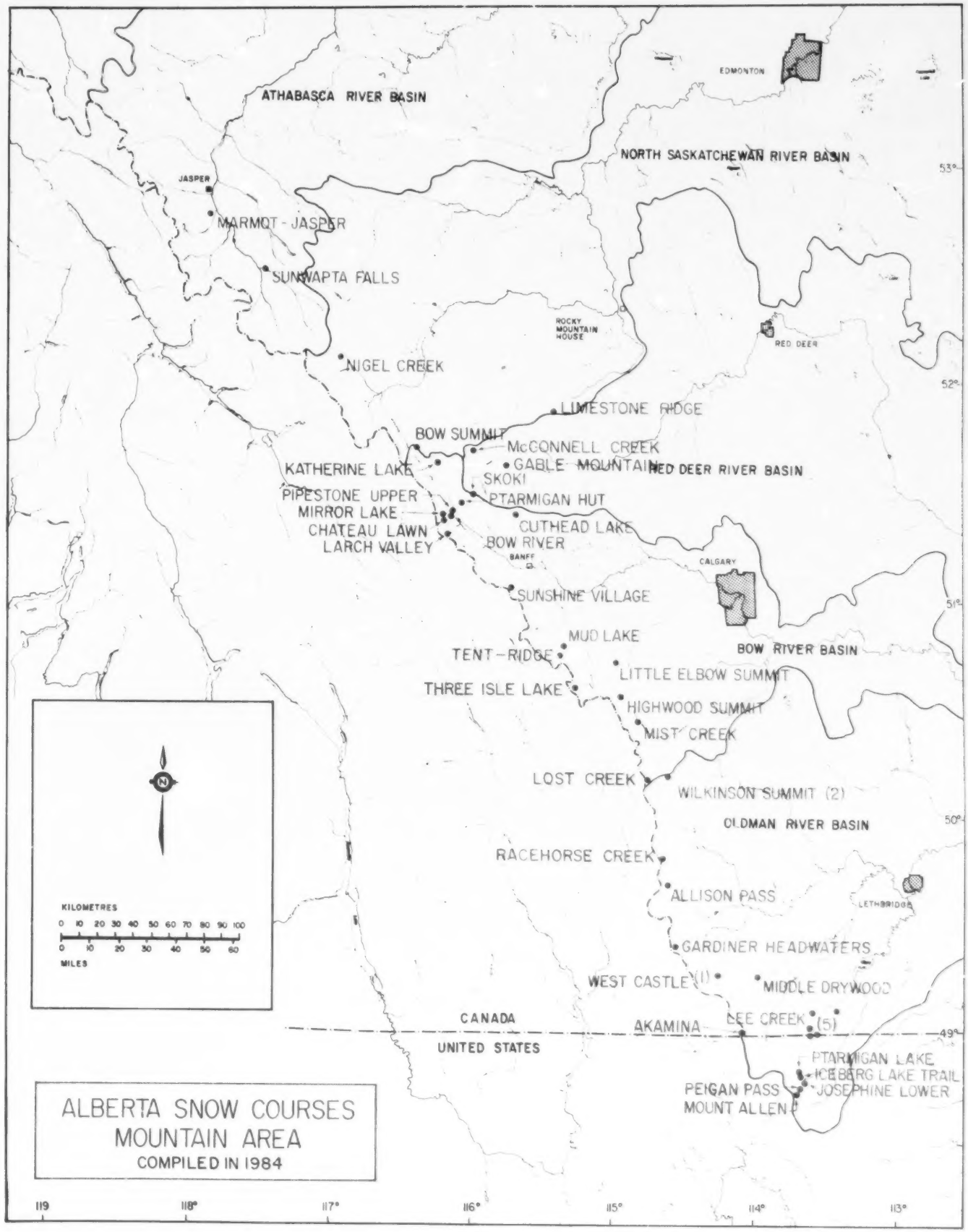
Gauge No.	Station Name	Date of Reading 1985 (Mo-Day)	84/85 (mm)	Average (mm)	83/84 (mm)
CROWSNEST FOREST RESERVE					
A01	Castle Ranger Station	03-01	192	281	139
		04-01	222	321	178
A09	Carpenter Creek	03-01	218	212	N/A
		04-01	246	240	N/A
A11	Goat Creek	03-01	325	401	N/A
		04-01	350	457	445
B10	Crownest Creek	03-01	169	271	190
		04-01	192	294	229
C10	Oyster Creek	03-01	124	178	102
		04-01	147	200	130
C13	Livingstone Gap	03-01	92	132	N/A
		04-01	93	152	89
C16	Racehorse Creek	03-01	274	433	368
		04-01	312	527	395
D01	Willow Creek Ranger Station	03-01	N/A	N/A	N/A
		04-01	129	163	64
E01	West Porcupine	03-01	N/A	N/A	N/A
		04-01	N/A	117	N/A
BOW RIVER FOREST RESERVE					
G01	Highwood Ranger Station	03-01	87	110	50
		04-01	110	128	76
K01	Canmore Ranger Station	03-01	56	94	76
		04-01	129	106	89
L01	Ghost Ranger Station	03-01	3	94	53
		04-01	85	117	76
M01	Red Deer Ranger Station	03-01	31	86	63
		04-01	51	105	89

All storage gauge data collected with the cooperation of the Alberta Forestry Service.

Alberta
ENVIRONMENT

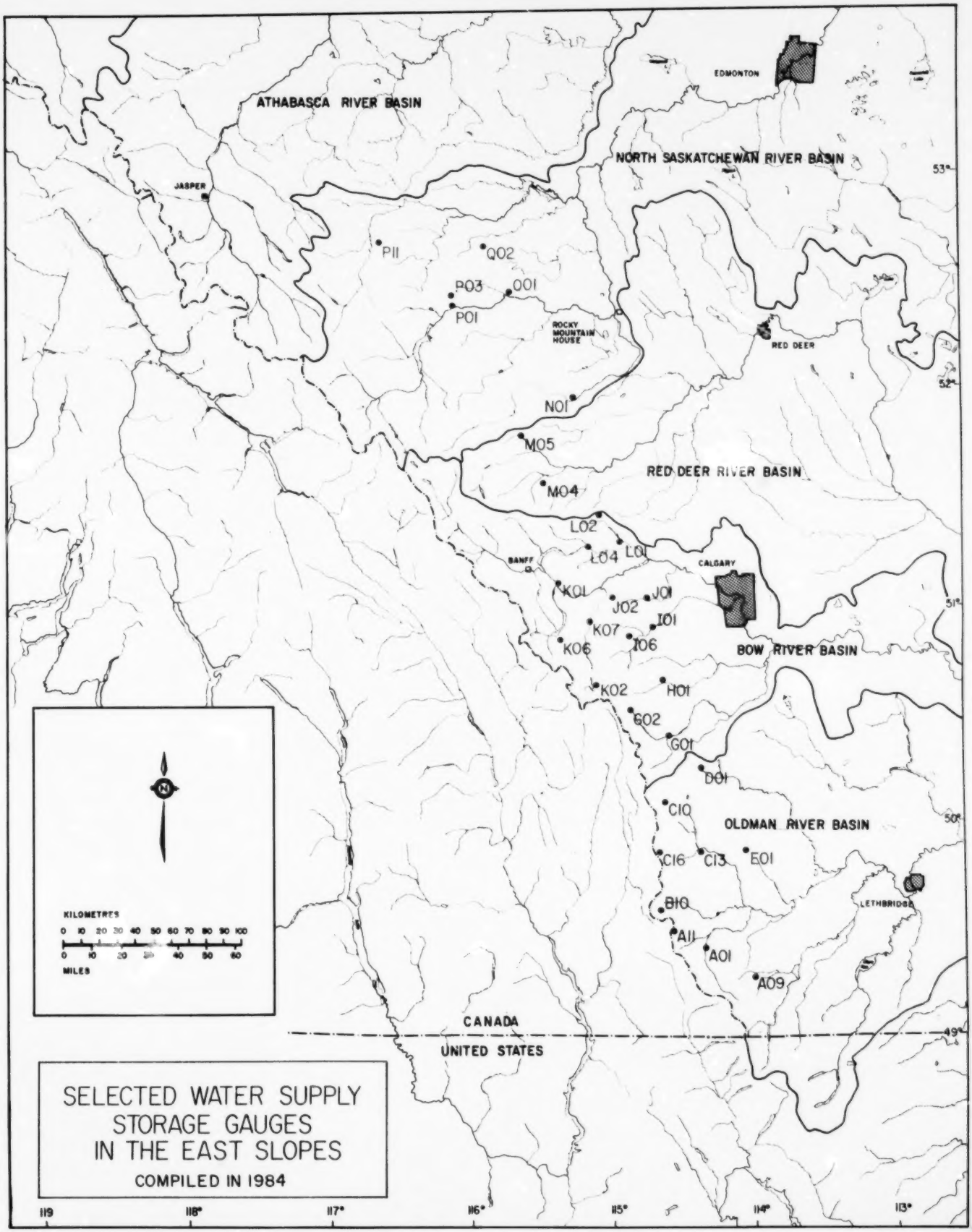
APPENDIX B
SNOW SURVEY LOCATIONS

Alberta
ENVIRONMENT


ATHABASCA RIVER BASIN
EDMONTON
NORTH SASKATCHEWAN RIVER BASIN
JASPER
MARMOT - JASPER
SUNWAPTA FALLS
ROCKY MOUNTAIN HOUSE
RED DEER
NIGEL CREEK
LIMESTONE RIDGE
BOW SUMMIT
McCONNELL CREEK
GABLE MOUNTAIN
RED DEER RIVER BASIN
KATHERINE LAKE
SKOKI
PIPESTONE UPPER
PTARMIGAN HUT
MIRROR LAKE
CUTHEAD LAKE
CHATEAU LAWN
BOW RIVER
LARCH VALLEY
BANFF
CALGARY
SUNSHINE VILLAGE
MUD LAKE
BOW RIVER BASIN
TENT - RIDGE
LITTLE ELBOW SUMMIT
THREE ISLE LAKE
HIGHWOOD SUMMIT
MIST CREEK
LOST CREEK
WILKINSON SUMMIT (2)
OLDMAN RIVER BASIN
RACEHORSE CREEK
ALLISON PASS
LETHBRIDGE
GARDINER HEADWATERS
WEST CASTLE (1)
MIDDLE DRYWOOD
CANADA
AKAMINA
LEE CREEK (5)
UNITED STATES
PTARMIGAN LAKE
ICEBERG LAKE TRAIL
PEIGAN PASS
JOSEPHINE LOWER
MOUNT ALLEN
KILOMETRES
0 10 20 30 40 50 60 70 80 90 100
0 10 20 30 40 50 60
MILES
ALBERTA SNOW COURSES
MOUNTAIN AREA
COMPILED IN 1984
53°
52°
51°
50°
49°
119
118°
117°
116°
115°
114°
113°

ALBERTA SNOW COURSES
MOUNTAIN AREA

Station Number	Name	Location Lat.	Location Long.	Elevation (m)	Year Established
ATHABASCA RIVER BASIN					
18W02	Marmot-Jasper	52°43'	118°05'	1830	1970
17W01	Sunwapta Falls	52°33'	117°39'	1400	1968
BOW RIVER BASIN					
16X01	Bow River	51°25'	116°11'	1580	1937
16X18	Bow River Summit (II)	51°42'	116°28'	2080	1979
16X08	Chateau Lawn	51°25'	116°13'	1740	1940
15X07	Cuthead Lake	51°27'	115°46'	2210	1979
14Y05	Highwood Summit (Bush)	50°36'	114°59'	2210	1963
16X16	Katherine Lake	51°41'	116°23'	2380	1980
16X14	Larch Valley	51°19'	116°13'	2230	1979
14Y20	Lost Creek	50°10'	114°43'	2160	1983
14Y18	Little Elbow Summit	50°42'	114°50'	2225	1979
16X06	Mirror Lake	51°25'	116°14'	2030	1940
14Y07	Mist Creek	50°31'	114°50'	1790	1965
16X15	Mount Skoki	51°32'	116°03'	2060	1979
15Y21	Mud Lake	50°47'	115°19'	1910	1973
16X02	Pipestone, Upper	51°26'	116°10'	1615	1937
16X09	Ptarmigan Hut	51°28'	116°06'	2190	1967
15X03	Sunshine Village	51°05'	115°47'	2230	1967
15Y24	Tent Ridge	50°51'	115°22'	2025	1981
15Y03	Three Isle Lake	50°38'	115°17'	2160	1981
NORTH SASKATCHEWAN RIVER BASIN					
15X09	Limestone Ridge	51°54'	115°26'	1950	1982
17W02	Nigel Creek	52°12'	117°05'	1920	1968
OLDMAN RIVER BASIN					
14Z07	Akamina	49°02'	114°03'	1800	1980
14Z03	Allison Pass	49°44'	114°36'	1980	1963
14Z10	Gardiner Headwaters	49°21'	114°01'	1970	1983
13Z02	Lee Creek Site D	49°01'	113°37'	1660	1971
13Z03	Lee Creek Site E	49°01'	113°39'	1675	1971
13Z04	Lee Creek Site F	49°03'	113°29'	1570	1971
13Z01	Lee Creek Site P	49°02'	113°34'	1525	1971
13Z08	Lee Creek Site Q	49°03'	113°36'	1500	1971
14Z05	Middle Drywood	49°15'	114°03'	1570	1963
14Z08	Racehorse Creek	49°49'	114°38'	1920	1983
14Z01	West Castle (Bush)	49°19'	114°24'	1520	1967
14Y09	Wilkinson Summit (Bush)	50°12'	114°33'	1980	1963
14Y08	Wilkinson Summit (Open)	50°12'	114°33'	1980	1964
RED DEER RIVER BASIN					
15X05	Gable Mountain	51°38'	115°45'	2150	1981
16X17	McConnell Creek	51°41'	115°59'	2130	1981

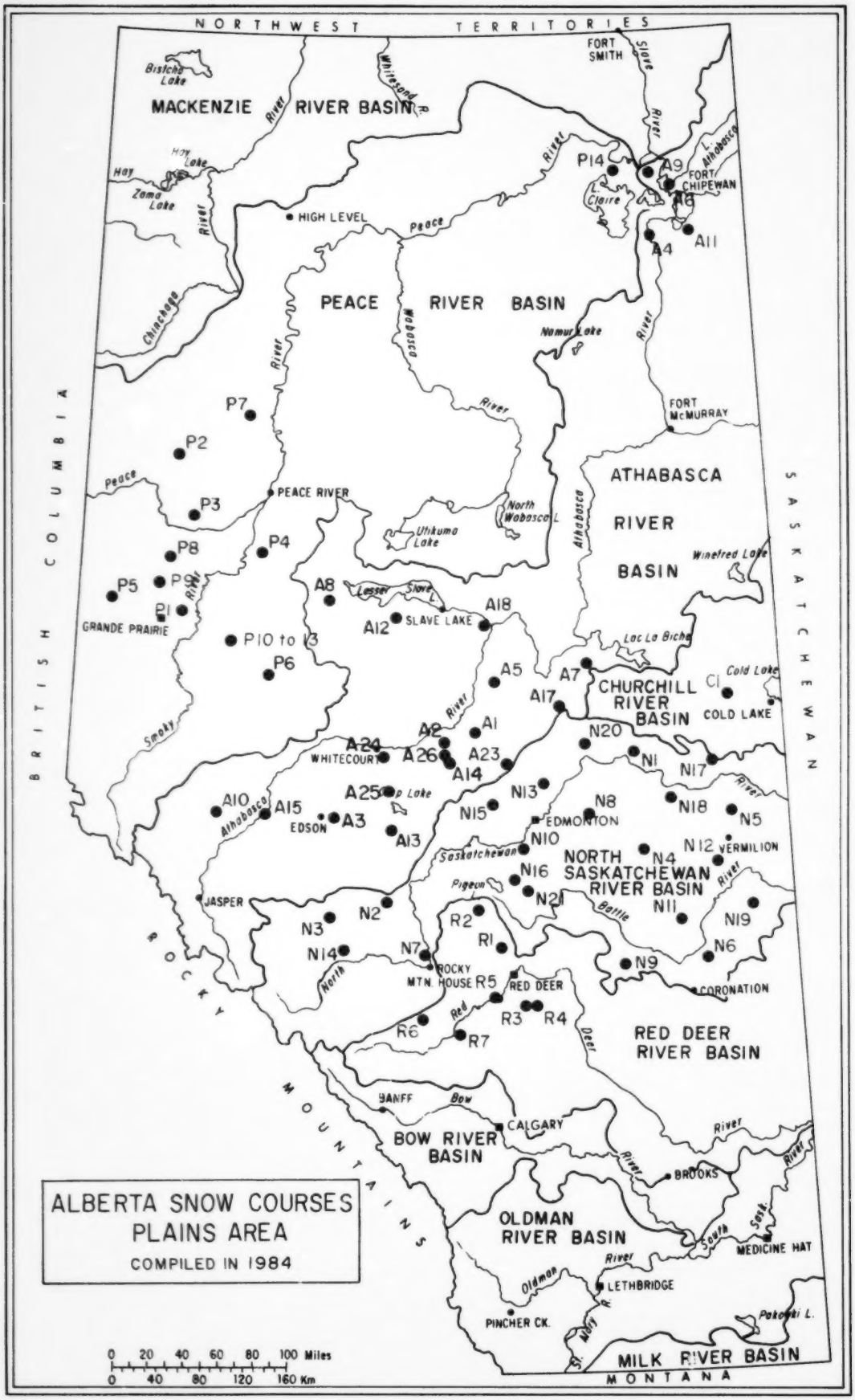


SELECTED WATER SUPPLY STORAGE GAUGES IN THE EAST SLOPES

COMPILED IN 1984

ALBERTA FOREST SERVICE
SACRAMENTO STORAGE GAUGE NETWORK

Gauge Number	Name	Location Lat.	Long.	Elevation (m)	Year Established
CROWSNEST FOREST RESERVE					
A01	Castle Ranger Station	49°23'	114°21'	1390	1953
A09	Carpenter Creek	49°15'	114°03'	1680	1956
A11	Goat Creek	49°29'	114°34'	1860	1964
B10	Crowsnest Creek	49°36'	114°40'	1460	1954
C10	Oyster Creek	50°07'	114°40'	1830	1955
C13	Livingstone Gap	49°52'	114°20'	1420	1954
C16	Racehorse Creek	49°49'	114°38'	1920	1964
D01	Willow Creek Ranger Station	50°14'	114°21'	1490	1956
E01	West Porcupine	49°51'	114°04'	1450	1953
BOW RIVER FOREST RESERVE					
G01	Highwood Ranger Station	50°23'	114°38'	1490	1953
G02	Mist Creek	50°31'	114°51'	1750	1953
H01	Sheep Ranger Station	50°36'	114°47'	1770	1953
I01	Elbow Ranger Station	50°54'	114°40'	1400	1953
I06	Ford Creek Summit	50°51'	114°53'	1830	1954
J01	Jumpingpound Ranger Station	51°02'	114°44'	1400	1953
J02	Sibbald Creek Summit	51°02'	114°59'	1550	1954
K01	Canmore	51°07'	115°22'	1330	1953
K02	Kananaskis Lakes	50°38'	115°07'	1680	1953
K06	Mud Lake	50°51'	115°21'	1905	1954
K07	Kananaskis Ranger Station	50°54'	115°08'	1510	1954
L01	Ghost Ranger Station	51°20'	114°57'	1370	1953
L02	Mockingbird Lookout	51°25'	115°04'	1905	1963
L04	Ghost Diversion	51°18'	115°08'	1600	1963
M04	Panther River	51°35'	115°28'	1860	1964
M05	Scalp Creek	51°48'	115°39'	2040	1964
CLEARWATER FOREST RESERVE					
N01	Clearwater Ranger Station	51°59'	115°20'	1280	1953
P01	Nordegg Ranger Station	52°29'	116°06'	1370	1953
P03	Shunda Baldy Lookout	52°32'	116°07'	2080	1964
P11	Brown Creek	52°43'	116°45'	1830	1964
Q01	Shunda Ranger Station	52°20'	115°47'	1400	1954
Q02	Atlas Lumber	52°42'	115°27'	1220	1956


NORTHWEST TERRITORIES
MACKENZIE RIVER BASIN
PEACE RIVER BASIN
ATHABASCA RIVER BASIN
CHURCHILL RIVER BASIN
NORTH SASKATCHEWAN RIVER BASIN
RED DEER RIVER BASIN
BOW RIVER BASIN
OLDMAN RIVER BASIN
MILK RIVER BASIN
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA
ROCKY MOUNTAINS
FORT SMITH
FORT CHIPEWAN
FORT McMURRAY
HIGH LEVEL
PEACE RIVER
GRANDE PRAIRIE
SLAVE LAKE
WHITECOURT
EDSON
JASPER
EDMONTON
COLD LAKE
VERMILION
ROCKY MTN. HOUSE
RED DEER
CORONATION
CALGARY
BANFF
BROOKS
MEDICINE HAT
LETHBRIDGE
PINCHER CK.
Bistcho Lake
Hay Lake
Zama Lake
Chinchaga River
Whitegood R.
Slave River
L. Athabasca
L. Claire
Peace River
Wabasca River
Namur Lake
Utikuma Lake
North Wabasca L.
Athabasca River
Winefred Lake
Loc La Biche
Cold Lake
Lesser Slave L.
Smoky River
Pigeon L.
Battle River
Saskatchewan
North Saskatchewan River
Red Deer River
Bow River
Oldman River
South Saskatchewan River
St. Mary R.
Pakowki L.
P1 P2 P3 P4 P5 P6 P7 P8 P9 P10 to 13 P14
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12 A13 A14 A15 A17 A18 A23 A24 A25 A26
N1 N2 N3 N4 N5 N6 N7 N8 N9 N10 N11 N12 N13 N14 N15 N16 N17 N18 N19 N20 N21
R1 R2 R3 R4 R5 R6 R7
ALBERTA SNOW COURSES
PLAINS AREA
COMPILED IN 1984
0 20 40 60 80 100 Miles
0 40 80 120 160 Km

ALBERTA SNOW COURSES
PLAINS AREA

Station Name (#)	Location Lat.	Location Long.	Elevation (metres)	Year Established
ATHABASCA RIVER BASIN				
Barrhead, North (A1)	54°16'	114°21'	670	1973
Barrhead, West (A2)	54°11'	114°48'	670	1973
Edson (A3)	53°35'	116°14'	910	1973
Embarras Portage (A4)	58°23'	111°32'	210	1973
Flatbush (A5)	54°44'	114°05'	640	1973
Fort Chipewyan (A6)	58°45'	111°07'	210	1973
Grassland (A7)	54°49'	112°41'	570	1973
High Prairie (A8)	55°24'	116°25'	570	1973
Highrock Tower (A9)	58°48'	111°33'	210	1974
Hinton (A10)	53°32'	117°57'	1240	1973
Jackfish Village (A11)	58°25'	110°56'	210	1974
Kinuso (A12)	55°20'	115°24'	640	1973
Lodgepole (A13)	53°30'	115°21'	850	1961
Mayerthorpe (A25)	53°51'	115°19'	760	1982
Meadowview (A14)	53°59'	114°41'	670	1960
Obed (A15)	53°34'	117°13'	1090	1973
Perryvale (A17)	54°23'	113°10'	670	1973
Saulteaux River (A18)	55°10'	114°14'	570	1973
Twin Lakes (A26)	54°03'	114°48'	655	1982
Westlock (A23)	54°00'	113°58'	700	1959
Whitecourt (A24)	54°05'	115°36'	790	1973
CHURCHILL RIVER BASIN				
Bonnyville, North (C1)	54°30'	110°40'	540	1973
NORTH SASKATCHEWAN RIVER BASIN				
Bellis (N1)	54°07'	112°05'	671	1973
Brazeau (N2)	52°57'	115°41'	970	1977
Brown Creek (N3)	52°46'	116°26'	1340	1977
Bruce (N4)	53°17'	112°04'	670	1975
Clandonald (N5)	53°34'	110°52'	640	1973
Coronation (N6)	52°13'	111°15'	760	1973
Crimson Lake (N7)	52°25'	115°02'	970	1973
Elk Island National Park (N8)	53°35'	112°50'	700	1973
Gadsby (N9)	52°19'	112°23'	790	1973
Leduc (N10)	53°16'	113°33'	730	1973
Lougheed (N11)	52°40'	111°33'	670	1973
Manville (N12)	53°10'	111°12'	670	1973
Morinville (N13)	53°51'	113°29'	700	1973
Nordegg (N14)	52°24'	116°08'	1060	1973
Onoway (N15)	53°43'	114°10'	700	1973
Pipestone Creek (N16)	53°04'	113°49'	790	1976
St. Paul (N17)	53°59'	111°01'	640	1973
Two Hills (N18)	53°43'	111°43'	640	1973
Wainwright (N19)	52°43'	110°37'	670	1973
Waskatenau (N20)	54°11'	112°50'	640	1973
Wetaskiwin (N21)	52°59'	113°38'	790	1973
PEACE RIVER BASIN				
Bezanson (P1)	55°14'	118°31'	700	1973
Eureka River (P2)	56°31'	118°44'	700	1973
Fairview (P3)	56°03'	118°24'	640	1973
Girouxville (P4)	55°46'	117°20'	570	1973
Hythe (P5)	55°19'	119°34'	760	1973
Little Smoky River (P6)	54°44'	117°09'	670	1973
North Star - Manning (P7)	56°52'	117°38'	480	1973
Rycroft (P8)	55°42'	118°44'	640	1973
Sexsmith (P9)	55°27'	118°53'	850	1973
Spring Creek Watershed Site #1 (P10)	54°57'	117°51'	710	1967
Spring Creek Watershed Site #2 (P11)	54°55'	117°45'	650	1967
Spring Creek Watershed Site #3 (P12)	54°57'	117°41'	730	1967
Spring Creek Watershed Site #4 (P13)	54°55'	117°41'	730	1967
Sweetgrass (P14)	58°51'	112°00'	210	1977
RED DEER RIVER BASIN				
Bentley (R1)	52°29'	114°04'	910	1973
Hoadley (R2)	52°49'	114°23'	970	1972
Kneehill Valley (R3)	52°00'	113°42'	970	1973
Innisfail (R4)	52°01'	113°35'	910	1973
Dickson (R5)	52°05'	114°10'	910	1973
James River (R6)	51°54'	115°00'	1210	1973
Sundre (R7)	51°47'	114°31'	1060	1973

Alberta
ENVIRONMENT

APPENDIX C

ALBERTA ENVIRONMENT

REAL-TIME CLIMATE STATIONS

Alberta
ENVIRONMENT

ALBERTA ENVIRONMENT REAL-TIME CLIMATE STATIONS

OLDMAN RIVER BASIN

MONTHLY PRECIPITATION 1984 - 85

Precipitation in millimetres

STATION	MAP CODE	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Akamina	1	126	133	20	98	84	136	66	117	13	114	183	178
Beauvais	10	15	29	7	22	32	40	54	19	38	159	224	78
Chief Customs	4	40	88	11	48	56	72	68	49	15	137	202	114
Gardiner Creek	9	190	200	21	93	91	136	53	74	6	138	237	195
Goat Haunt	2	174	139	8	76	69	122	48	92	5	103	121	182
Lee Creek	5	1	34	10	31	34	41	66	36	31	110	178	95
Pasque	13	26	45	6	16	32	102	40	53	21	65	124	77
Racehorse Creek	12	88	84	10	45	53	139	67	86	10	106	187	163
Red Rock	6	78	76	5	51	36	68	52	61	15	135	173	119
St. Mary Ranger Stn.	3	59	63	28	45	33	45	52	75	9	84	160	109
Spionkop	7	157	175	17	115	98	168	76	86	7	170	318	246
Vicary Creek	11	20	34	9	21	24	55	41	50	11	78	124	78
West Castle	8	146	122	17	83	49	152	47	87	4	137	184	186

NOTES: 1. The map code refers to the station location number on the key map which follows.

2. Average monthly precipitation values have not yet been established for these stations.

Alberta ENVIRONMENT

ALBERTA ENVIRONMENT REAL-TIME CLIMATE STATIONS

BOW RIVER BASIN

MONTHLY PRECIPITATION 1984 - 85

Precipitation in millimetres

STATION	MAP CODE	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Compression Ridge	20	13	23	7	25	34	81	72	41	39	139	135	50
Cox Hill	21	5	28	7	23	26	102	76	44	38	178	161	61
Cuthead Lake	27	52	54	5	41	20	76	58	94	24	124	92	157
Elbow Ranger Station	22	4	18	10	16	25	72	52	44	31	162	128	36
Evans-Thomas Creek	19	32	43	7	29	35	104	62	61	25	138	142	80
Forget-me-not	16	11	23	11	25	35	100	85	24	33	164	157	50
Ghost Diversion	25	5	18	0	28	29	71	52	40	43	96	124	41
Ghost Ranger Station	26	5	12	6	18	22	48	41	46	46	87	122	34
Jumpingpound Ranger Stn.	23	6	18	7	21	5	61	N/A	26	23	N/A	137	34
Little Elbow Summit	17	58	68	7	44	36	119	61	77	28	140	158	108
Sheep II	15	8	21	8	21	31	74	72	33	31	135	128	39
Sullivan	14	4	19	8	18	32	50	50	N/A	N/A	104	125	31
Sunshine Village	24	74	97	7	48	35	107	66	N/A	N/A	102	128	201
Three Isle Lake	18	113	132	7	58	43	151	78	125	20	123	172	187

NOTES: 1. The map code refers to the station location number on the key map which follows.

2. Average monthly precipitation values have not yet been established for these stations.

Alberta ENVIRONMENT

ALBERTA ENVIRONMENT REAL-TIME CLIMATE STATIONS

RED DEER RIVER BASIN

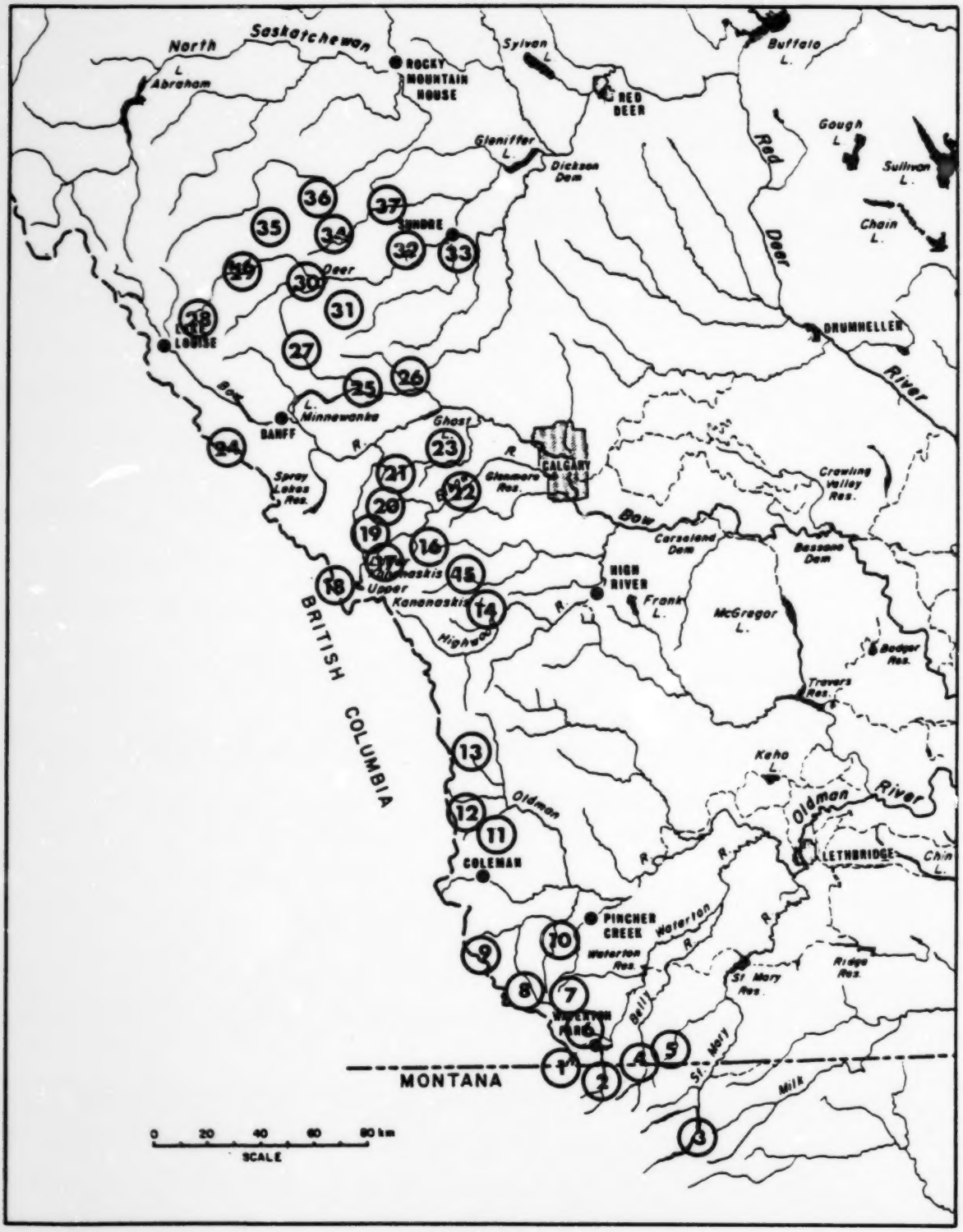
MONTHLY PRECIPITATION 1984 - 85

Precipitation in millimetres

STATION	MAP CODE	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT
Coal Camp	32	2	10	6	26	15	64	58	39	49	96	139	40
Dogrib	30	9	15	3	20	16	76	61	66	32	114	122	48
Fallentimber	31	3	10	5	18	23	63	60	52	28	99	141	41
James River Headwaters	34	3	10	5	23	15	81	77	49	46	127	140	33
James River Ranger Stn.	37	10	9	9	23	16	44	53	41	41	107	122	33
Limestone	36	5	10	10	28	20	86	50	70	43	108	160	44
Scalp Creek	35	7	17	8	26	19	67	36	86	26	131	130	46
Scotch Camp	29	15	21	0	13	5	31	36	38	23	74	62	48
Skoki	28	50	76	6	43	20	78	55	79	31	104	87	139
Sundre Ranger Station	33	8	10	3	22	3	46	55	45	N/A	84	152	26

NOTES: 1. The map code refers to the station location number on the key map which follows.

2. Average monthly precipitation values have not yet been established for these stations.



KEY MAP FOR
ALBERTA ENVIRONMENT
REAL-TIME CLIMATE STATIONS